BIG GAME FISHING IN THE NORTHERN GULF OF MEXICO DURING 1977.

BY

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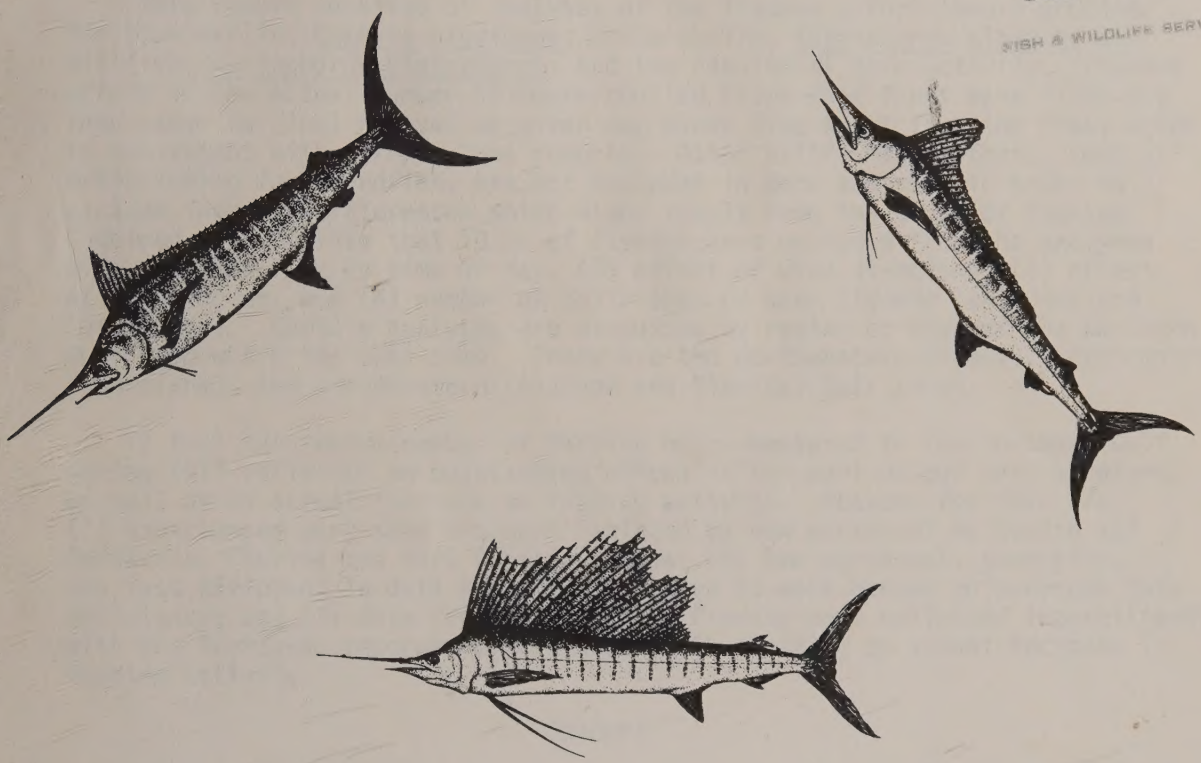
FISH & WILDLIFE SERVICE



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NATIONAL MARINE FISHERIES SERVICE

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INTRODUCTION

The 1977 billfishing season in the northern Gulf of Mexico was a season filled with records. From a Gulf rod and reel record 1018-lb blue marlin in Louisiana, to a State record bluefin tuna and swordfish in Texas, to a fishing record "Grand Slam" in Florida, the 1977 season was documented with a record amount of measured fishing effort of more than 24,000 hr.

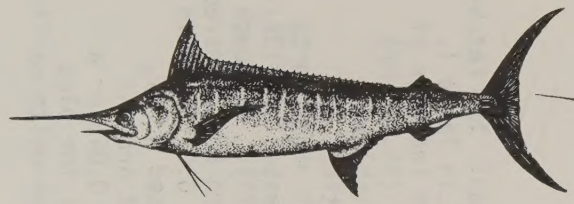
This report consists of analyses of the fishing effort (hours trolled) for blue marlin, Makaira nigricans; white marlin, Tetrapturus albidus; and sailfish, Istiophorus platypterus; and the results of this activity. Fishing effort is the actual number of hours trolled (time when lines were first put into water to final removal on given day minus time spent fighting fish) which is consistent with our previous reports. Other billfishing efforts, such as driftfishing for swordfish, are not included in data analyses in order to exclude inherent differences which might result from the style of fishing. Combined data of less that 10 hr of fishing were excluded from the analyses of: (1) hook rate by time of day, (2) effect of wind direction, (3) effect of cloud cover, and (4) number of billfishes by area (10-min latitudes and longitudes). Certain analyses are discussed by region or area of the northern Gulf from which the data came. These are the northwestern (Texas), northcentral (Louisiana), and northeastern (Alabama and Florida) Gulf areas.

I feel the record number of fishing hours measured in the northern Gulf during 1977 reflected an outstanding effort on the part of our port samplers, as well as an actual increase in fishing activity. Reasons for this are: (1) experienced port samplers were replaced by new personnel at Destin and Pensacola, Florida and Port Aransas, Texas; (2) new personnel, generally, are less efficient in data gathering and have to work harder to overcome this deficiency; and (3) data from Panama City, Florida were collected intermittently with the increased recorded effort strongly suggesting an actual increase in fishing activity.

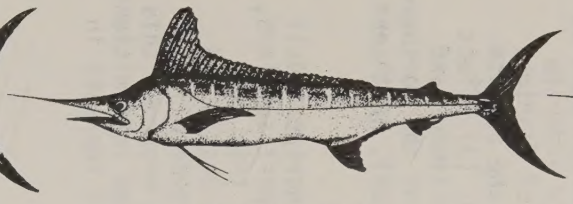
CATCHES

Hours fished, the number of fishes caught (releases included), the catch-per-hour-of-trolling (CPH) and its reciprocal are shown by port in Table 1. The 24,487 hr measured from the northern Gulf during 1977 was an increase of 6,803 hr or 38% over the second highest season (1976) and a 88% (11,493 hr) increase over the previous 6-yr average. Forty per cent (452 fish) or nearly one half of the 1,121 recorded catches occurred from Destin. In decreasing order percentages and numbers of billfishes landed at other ports were: Port Aransas, 15% (168); Panama City, 13% (150); South Pass, 12% (136); Pensacola, 8% (95); Orange Beach, 8% (93); and Grand Isle, 2% (27). Although fishing effort increased from all ports only two showed increased CPH compared to 1976. By port, CPH comparisons were: Panama City increased 0.025, Destin decreased 0.012, Pensacola decreased 0.018, Orange Beach increased 0.001, South Pass decreased 0.003, Grand Isle decreased 0.018, and Port Aransas decreased 0.071. For the entire northern Gulf, CPH in 1977 was 0.046 or a decrease of 0.024 from the 1976 season. The highest CPH (0.012) for blue marlin was recorded from South Pass. The highest CPH (0.045) for white marlin and for sailfish (0.044) occurred from Panama City.

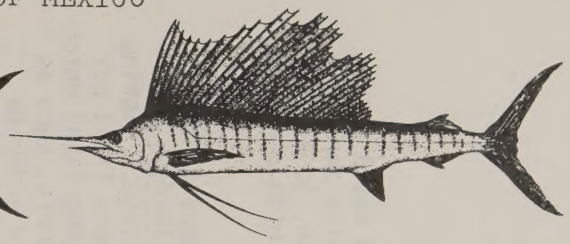
1977 SUMMARY FOR THE NORTHERN GULF OF MEXICO



BLUE MARLIN



WHITE MARLIN



SAILFISH

	BLUE MARLIN	WHITE MARLIN	SAILFISH
Number of 6 hr fishing trips to catch a	18.8	8.5	9.7
Size range (pounds)	57.5 - 1,018.5	28.5 - 102.4	5.5 - 84.5

Peak feeding times for all billfishes: ----------6 - 7 A.M.----------10 - 11 A.M.----------7 - 8 P.M.---------

Relative abundance

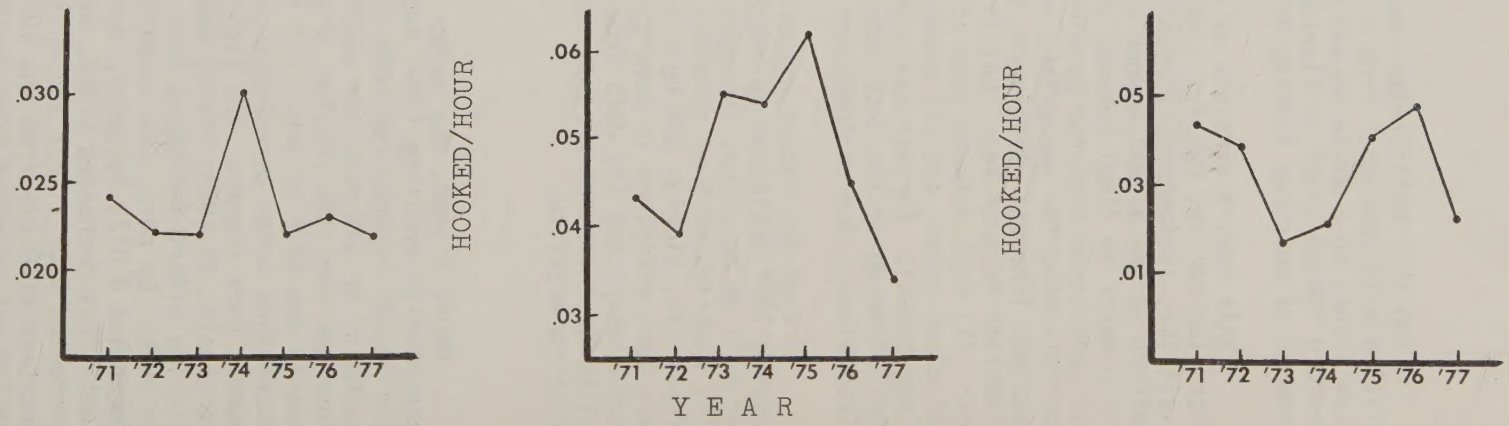


Figure 1 shows the CPH for each species and for all species combined from 1971 to 1977. The CPH in 1977 decreased from the 1976 CPH for each of the three species and for the combined catches. The catch rate of blue marlin (0.009) changed the least with a decrease of 0.001 fish-per-hour-of-trolling. The 1977 CPH for blue marlin was equal to or above three other seasons, and the decrease does not appear to be significant. The decrease (0.008) in CPH for white marlin was the second consecutive decrease and the third lowest CPH in 7 years. The CPH of sailfish had the greatest decline (0.014) of all three species and, similar to white marlin, was the third lowest in 7 years. However, this year's CPH of sailfish was the first decrease in the last 4 years and may only indicate normal fluctuation for a relatively short-lived species. The CPH for all billfishes declined to 0.046 fish-per-hour-of-trolling, a 34% decrease compared to the 1976 catch rate (0.070). The magnitude of this second consecutive decrease, as measure through recreational catch/effort data, may indicate that the availability of billfishes as a recreational resource in the northern Gulf is declining.

WEIGHTS

For all three species, the largest, smallest, and average weights are listed by port and for all areas combined in Table 2. This year a rod and reel record blue marlin which weighed 1,018.5 lb was caught off South Pass. The largest white marlin (102.4 lb) of the season was also landed at South Pass. A 84.5 lb sailfish landed at Port Aransas was the largest of this species. The smallest blue marlin (57.5 lb) was reported from Texas. The smallest white marlin (28.5 lb) was recorded at Destin, while the smallest sailfish (5.5 lb) were landed at Destin and Port Aransas.

Figure 2 shows the average weights for each species from 1971 to 1977. The average weight of blue marlin in 1977 was 272 lb; a record high for the Gulf area that was considerably above the previous 6-yr average of 247 lb. If the exceptionally large blue marlin landed at South Pass was not included in the 1977 calculations, the average weight would have decreased only by 3 lb, still making the 1977 average the highest on record. Blue marlin from the northcentral Gulf were considerably heavier than those from adjacent areas to the east or west. In the northcentral Gulf, blue marlin averaged 309 lb. Fish from the northeastern and northwestern areas averaged 248 and 252 lb, respectively. This is consistent with our past findings: blue marlin caught off the Louisiana coast average larger than those from areas to the east or west. This could possibly indicate a different stock of fish is available to the recreational fishery in the northcentral Gulf, than in the northeastern or northwestern Gulf areas.

The average weight of white marlin was 53 lb, the same as in 1976. The 7-yr average weight of white marlin has been 54 lb, and their yearly average weights have fluctuated least (5 lb) of all three species. Larger white marlin do not appear to consistently occur in any one area of the Gulf.

During 1977, sailfish averaged 41 lb. This was 3 lb below the previous 6-yr average and the second lowest yearly average we had recorded. Last year we reported the record CPH of average size sailfish indicated this species was apparently a healthy recreational resource. The considerable drop in CPH this year of smaller than average fish may be our first indications of stress for this species. Further monitoring of this resource will be essential to determine the status of this resource.

SEX RATIOS

Table 3 shows the sex ratios of all billfishes examined in 1977. Female blue marlin outnumber males by 4:1, a greater margin than at anytime between 1971-76. The female to male ratio of 10:1 at South Pass was the highest recorded at any port from 1971 to 1976. An interesting contrast was the majority of males reported from Grand Isle, the closest port to South Pass. However, sex was determined on so few fish at this port that any conclusions should be made with caution. For white marlin, the female to male ratio of 1.5:1 was the lowest ratio since 1972 when the ratio equalled that of this year. Female sailfish outnumbered males at all ports except one. Overall, the 1977 male to female ratio for sailfish was similar to those for the last several seasons.

HOOK RATE BY TIME OF DAY

Although billfishes may strike at baits or lures for reasons other than hunger, we believe strikes are still our best indicators of feeding activity. We used the number of fish hooked-per-hour-of-trolling by hourly periods of the day to determine feeding activity related to time of day. These data are given in Figures 3-6.

Figure 3 shows feeding activity by hour of day in the northern Gulf of Mexico. For all species combined, there were three active periods: early morning, late morning, and early evening. These findings concur with those reported last year: data from 1971 to 1976 were combined and showed three very similar feeding periods. Blue marlin were most active during the 2000 hr period. However, during this period and during the 0500 hr period less than 25 hr of fishing occurred and care should be taken when making conclusions from these few data. In general, white marlin exhibited a midmorning and an early evening feeding period. Four peak feeding periods (0600, 1000, 1600-1700, and 1900 hr) for sailfish were very similar to those reported last year.

In the northeastern Gulf, the hook rate for all species combined indicated three periods of increased feeding activity: 1000, 1600, and 1900 hr (Figure 4). The highest hook rate for blue marlin occurred at 0500 hr, a period when only 20 hr of fishing were recorded. During the other hourly periods, blue marlin exhibited feeding activity very similar to that for all species combined. Feeding activities of white marlin were harder to determine. However, a pattern was shown by defining a peak period as one preceeded by at least two low periods. With this criteria, feeding periods of late morning (1100 hr), late afternoon (1600 hr), and early evening (1900 hr) were determined. Sailfish were hooked frequently during the 1000 hr period and, again, between 1500 and 1700 hr.

In the northcentral Gulf, the hook rate for billfishes was highest at 1700 hr (Fig. 5). This peak was primarily due to eight blue marlin and three white marlin hooked in about 100 hr of fishing. The other two peak periods of 0900 and 1400 hr, also, were due to the combined activity of these two species. Sailfish were hooked so infrequently (14 in 1977) that it was difficult to determine feedings periods even though the hook rates at 1600 and 1700 hr were almost twice those for any other period.

In the northwestern Gulf, the highest hook rate for billfishes occurred during the 0600 hr period (Fig. 6). Although only 44 hr of fishing were recorded for this period, the hook rates for all three species were considerable during this time. Blue marlin exhibited greatest activity during the 2000 hr period. However, only 14 hr of fishing were recorded during this period. White marlin were more active before 0800 hr and after 1700 hr than during any other periods. In general, sailfish showed greatest feeding activity during early morning (0600 hr), late morning (1000 hr), and late afternoon (1700 hr).

EFFORT AND RELATIVE ABUNDANCE

Fishing effort from the three areas of the northern Gulf and from each port are given in Table 4. The number of hours recorded in 1977 more than doubled the effort recorded (11,107.1 hr) in 1971. Of the 24,487 hr recorded this season, 46% was from the northeastern Gulf, 33% from the northcentral Gulf, and 21% for the northwestern Gulf. All data collected along the Texas coast were listed as Port Aransas from where most of the data were measured. An increase in recorded effort occurred at every port, with South Pass and Destin the most active ports. Each represented 22% of the total effort.

The number of fish hooked-per-hour-of-trolling is our estimate of catch-per-unit-of-effort (CPUE) or apparent relative abundance. It is difficult to measure true relative abundance as fish may be in an area but, for one reason or another, not seen or counted. The term "apparent relative abundance" is, therefore, more accurate but for brevity "relative abundance" is used in this report.

For each species and for all billfishes combined, the relative abundances and the number of hours trolled to hook one fish are given in Table 4. As in past seasons, blue marlin were most abundant in the northcentral area; the highest hook rate (0.030) occurred out of South Pass. White marlin and sailfish were most abundant in the northeastern Gulf. Highest abundances of each species were recorded at Panama City and were 0.092 and 0.063 for white marlin and sailfish, respectively. The northeastern Gulf had the highest abundance of all billfishes (0.117); the highest hook rate was 0.183 from Panama City. For all areas combined, white marlin appeared to be most abundant (0.034). Relative abundances of blue marlin (0.022) and sailfish (0.023) were about equal.

Figure 7 shows the yearly relative abundances of billfishes from 1971 to 1977. The number of fish hooked-per-hour-of-trolling decreased for each of the three species. Compared to 1976, blue marlin decreased in relative abundance by 4%, white marlin by 24%, sailfish by 52%, and all billfishes by 31%. Even though white marlin were the most abundant of the three species, the considerable decreased in the last two seasons in the relative abundance of these fish indicated the resource may possibly be under stress. The appreciable decrease in the relative abundance of billfishes in 1977 suggested low availability of these fishes as measured by recreational fishing effort.

The relative abundances of billfishes as determined with commercial data (Japanese longline fishery) and recreational data (U. S. sport fishery) are shown in Figure 8. When interpreting these data the following dissimilarities

between the two fisheries should be considered: (1) fishing gear; (2) fishing techniques; (3) estimate of CPUE; (4) major fishing areas; and (5) the inclusion of spearfish in longline CPUE data of sailfish.

Considering these dissimilarities, several year to year correlations in trends in CPUE were apparent. In both fisheries, CPUE of blue marlin and white marlin tended in the same direction almost every time. These findings suggest that both fisheries are measuring similar reactions of blue marlin and white marlin to fishing pressure, the environment, or both. In contrast, relative abundance estimates for sailfish and for all billfishes indicated a negative correlation. With one exception, whenever CPUE increased in one fishery it decreased in the other fishery. For sailfish and all billfishes, the availability or relative abundance comparisons may be possible on a negative correlation basis. Future data will be important in determining the accuracy of these comparisons.

Monthly relative abundances of billfishes are shown by area in Figure 9. The high abundance of billfishes in the northeastern Gulf in April resulted from four blue marlin hooked during 20 hr of fishing. Substantially more effort was recorded in other months during which the highest abundances of marlin occurred in October and of sailfish in August. In the northcentral Gulf, excluding January when less than 20 hr of effort were measured, blue marlin were most abundant in the autumn. The peak abundance of white marlin occurred in August. As in other comparisons, the low number of recorded sailfish catches in this area resulted in few data for valid conclusions. In the northwestern Gulf, the relative abundance of blue marlin steadily increased from March through May, then steadily decreased to September. Hookups with white marlin were only reported in July and August and were nearly equal in frequency. Sailfish were most abundant in the autumn with September the peak month.

BILLFISHES RAISED, HOOKED, AND BOATED

The numbers of billfishes raised, hooked, and boated are listed by area and port in Table 5. Fishermen in the northeastern Gulf boated or released 37% of the blue marlin, 59% of the white marlin, 75% of the sailfish, or 60% of all billfishes they hooked. In the northcentral Gulf, 40% of the blue marlin, 60% of the white marlin, 79% of the sailfish, or 49% of the billfishes that were hooked were boated or released. In the northwestern Gulf, the percentages of hooked blue marlin, white marlin, sailfish, and all billfishes that were boated or released were 45%, 41%, 74%, and 57%, respectively. For all areas combined, 40% of the blue marlin, 58% of the white marlin, 75% of the sailfish, or 57% of all billfishes that were hooked were boated or released.

Of interest is the fact that for the three species the percentages of raised fish that were hooked were nearly equal. Of the fish that were raised, blue marlin continued to be the hardest to land with 24% of the fish boated or released. Thirty-five percent of the white marlin and 44% of the sailfish that were raised were boated or released.

EFFECT OF WIND DIRECTION

The numbers of billfishes hooked-per-hour-of-trolling related to wind direction are shown in Table 6. In the northeastern Gulf, the hook rates

during periods of southerly (140-220°) and easterly (50-130°) winds were about equal and were higher than during any other period. The data for the northcentral area indicated that fishermen enjoyed considerably more action during periods of variable (calm included) winds. However, the relatively few hours fished during this period compared to other periods makes us cautious about such conclusions. In the northwestern Gulf the vast majority of data was recorded from fishing when the wind was from an easterly direction. However, the numbers of fish hooked-per-hour-of-trolling during periods of southerly and variable winds were higher than at other times and were nearly equal. For all areas combined, the hook rate was highest during periods of variable winds and almost as high when the wind was from a southerly direction.

EFFECT OF CLOUD COVER

Data on the numbers of billfishes hooked-per-hour-of-trolling and the amount (percent) of cloud cover are given in Table 7. For each area and for all areas combined, more fish were hooked-per-hour-of-trolling under cloudy (40% or greater cloud cover) conditions than at other times. Off the Texas coast, only 6 hr of fishing were recorded during the period of maximum (70-90%) cloud cover with no billfishes hooked during this period. No explanation for the low number of fishing hours recorded for these conditions is offered.

NUMBER OF FISH RAISED BY AREA

Charts 1-12 show the numbers of billfishes raised-per-hour-of-trolling in the three areas of the northern Gulf by 10-minute latitude and longitude squares. Within the fishing area (heavy black line), blank squares indicate no fish raised.

In the northeastern Gulf, blue marlin were raised in 35 (69%) of the 51 squares fished (Chart 1). These fish were, generally, more abundant along the 200-fath curve and beyond. This concurs with the findings reported last year (combined data from 1971 to 1976) which showed blue marlin were most abundant from the 200-fath line and deeper. The greatest number of blue marlin raised-per-hour-of-trolling was in an area (square F-118) in which only 20 hr of fishing were recorded. White marlin were raised in 82% (42) of the area fished (Chart 2) and were nearly as widely distributed as were sailfish. The greatest abundance of white marlin was in an area (square F-125) where relatively little fishing was reported. In general, these fish were raised most frequently from about the 100-fath line and beyond. Sailfish were the most widely distributed of the three species (Chart 3). These fish occurred in 86% (44) of the fishing area. With one exception (square F-126), sailfish were raised most often inside the 100-fath curve. Billfishes were more widely distributed in 1977 (Chart 4), than during the past two seasons. In 1977, billfishes were raised in 94% (48) of a fishing area that was larger than the areas fished in either 1976 or 1975. In 1976 and 1975, billfishes were raised in 91% and 86% of the areas fished, respectively. What the wide distribution meant to the status of the fishery is a matter of interpretation. One might say, the widely distributed fish should have been easier to locate, however, catches were down so apparently the fish were not plentiful. Another could say, fish were as plentiful as before but the lack of concentrations reduced fishing success.

In the northcentral Gulf, blue marlin were raised in 67% (39) of the 58 squares fished (Chart 5). Blue marlin were the most widely dispersed of the three species and, generally, were least abundant inside the 200-fath curve. Although white marlin occurred in about one-half of the area fished (Chart 6), conclusions regarding their distribution are difficult to make because relatively few hours were fished in each of the three areas of high abundance. Sailfish, the least abundant of the three species, were reported raised in only 21% (12) of the area fished (Chart 7). These fish were raised most frequently inside the 100-fath line. Billfishes were raised in 78% (45) of the area fished (Chart 8). With one exception, the areas of mid and high abundances were from the 200-fath curve and beyond. Fish were about equally distributed east and west of South Pass. Billfishes were raised in 77% of the fishing area east of longitude 89°W and 81% of the area fished west of longitude 89°10'W.

In the northwestern Gulf, the area fished in 1977 (Chart 9) was 11% more than the combined area report last year for the years 1972 to 1976. Blue marlin were raised in 34 (49%) of the 69 squares fished. Off Port Aransas and Port Isabel, blue marlin were raised in 60% and 36% of the respective areas. All reported raises were along the 30-fath curve and beyond. White marlin were raised in 32% (22) of the areas fished (Chart 10) and were least widely distributed of the three species. This species was reported from 55% (22) of the area fished off Port Aransas and in only 7% (2) of the area fished off Port Isabel. This could possibly be due to the fact that our sampling in southern Texas was restricted to a smaller portion of the fishing season. Sailfish were raised in 64% (44) of the area fished (Chart 11). Higher abundances of these fish were, generally, in the nearshore areas (less than 50-fath) with the greatest abundance along the 30-fath line. Billfishes were raised in 80% (55) of the area fished (Chart 12). The two high abundance areas were along the 30-fath line off Port Aransas and Port Isabel and, most likely, resulted from the high abundance of sailfish in each of these squares.

OTHER INTERESTING FACTS

During 1977 the following additional information came from the northern Gulf of Mexico section of the Oceanic Game Fish Investigations.

1. Several State records were established in Texas: (a) a 691-lb blue marlin was caught by Don Dashiell aboard *For the Good Times* captained by Mike Hennessy, Freeport; (b) a 540-lb bluefin tuna, Thunnus thynnus, was caught from aboard the *Wolverine* by Pat Hawn; (c) the *Jolly Holly* came in with a 388-lb mako shark, Isurus oxyrinchus; (d) a 67-lb dolphin Corphaena sp., was landed aboard the *Careyon*; and (e) the first swordfish, Xiphias gladius, reported caught with rod and reel was boated during the Texas Open Tournament, Freeport, by Skip Martin aboard the *Scotch N' Water* captained by Ron Pierce. These catches were not included in the data analysis.

2. Record "Grand Slams" (i.e., catches of blue marlin, white marlin and sailfish on one trip) were documented in Florida. At Destin, Capt. Royal Melvin brought in a fisherman's record third "Grand Slam" of his career aboard the *Bijou*. Capt. Ed Robinson, aboard the *Ballyhoo*, brought in the first "Grand Slam" ever caught during the Destin Rodeo.

3. Catches of yellowfin tuna, Thunnus albacares, have become more frequent in the northeastern Gulf than they were during the beginning years of this study. A total of 59 fish were reported boated or released during 1977. The largest, a 208.5-lb yellowfin, was brought into Pensacola aboard the *Venture II*.

4. Several rare catches of billfishes were reported this season. Spearfish, Tetrapturus pfluegeri, were brought into Destin aboard the *Miss Lisa* and into South Pass aboard the *Dongi* and the *Hager's*. A swordfish was landed at South Pass from aboard the *Isabel*, and another was reported brought into Destin aboard the *Widowmaker*.

ACKNOWLEDGMENTS

We are grateful for the cooperation given by the anglers, charter boatmen, and officers of sport fishing groups: Organizers of the Texas Championship Billfish Tournament, and the Boatman's Association, Port Aransas; Jesse and Jacquie Edmundson, Freeport; Russ Wilhour, Key Allegro; Walter Fondren, Port O'Conner; Organizers of the Texas International Fishing Tournament, Port Isabel; Russell and Betty Cheramie, the Golden Meadow Big Game Fishing Club; Herman "Dutch" Prager, Jr., and Maumus Claverie, Jr., the New Orleans Big Game Fishing Club; William Myers, the Baton Rouge Big Game Fishing Club; John Arata and Larry Johnson, the Mobile Big Game Fishing Club; Earl Owens, the Pensacola Big Game Fishing Club; Al Clark, the Fort Walton Beach Sailfish Club; Royal Melvin, the Destin Charter Boat Association; and Buster Niquet, the Panama City Fishing Association.

While gathering the record 24,487 hr of fishing data, our port samplers made about 3,480 interviews throughout the season. I thank Russell Vetter, Port Aransas; Myron Fischer, Grand Isle; Joe Yurt, South Pass; Karen Brockham, Pensacola; and John Wright, Destin, for their outstanding work throughout the season.

I express my gratitude to the following people whose services helped expedite this report: at the Panama City Laboratory, Lucius Johnson for data compilation, Carl Saloman for the preparation of figures, and Rita Bloechel for the preparation of text and tables; and at the Pascagoula Laboratory, Dorothy Latady and her staff for the printing of this report.

Table 1.--Hours trolled, recorded catches, catch-per-hour, and hours trolled to catch one fish, for billfishes in the northern Gulf of Mexico, 1977

	Panama City	Destin	Pensacola	Orange Beach	South Pass	Grand Isle	Port Aransas	All Areas Combined
Total Hr fished	1,579.9	5,477.8	2,192.7	2,028.4	5,500.3	2,670.3	5,037.6	24,487.0
Number of recorded catches								
Blue marlin	10	51	11	20	68	9	48	217
White marlin	71	208	66	42	60	15	20	482
Sailfish	69	193	18	31	8	3	100	422
All billfishes	150	452	95	93	136	27	168	1,121
Catch-per-hour								
Blue marlin	0.006	0.009	0.005	0.010	0.012	0.003	0.010	0.009
White marlin	0.045	0.038	0.030	0.021	0.011	0.006	0.004	0.020
Sailfish	0.044	0.035	0.008	0.015	0.001	0.001	0.020	0.017
All billfishes	0.095	0.083	0.043	0.046	0.025	0.010	0.033	0.046
Hours trolled to catch a								
Blue marlin	158.0	107.4	199.3	101.4	80.9	296.7	105.0	112.8
White marlin	22.3	26.3	33.2	48.3	91.7	178.0	251.9	50.8
Sailfish	22.9	28.4	121.8	65.4	687.5	890.1	50.4	58.0
All billfishes	10.5	12.1	23.1	21.8	40.4	98.9	30.0	21.8

Table 2.--Recorded weights (pounds) of billfishes caught in the northern Gulf of Mexico, 1977

	Panama City	Destin	Pensacola	Orange Beach	South Pass	Grand Isle	Port Aransas	All Areas Combined
Blue marlin								
Largest	461.0	460.5	454.0	425.5	1,018.5	347.5	565.5	1,018.5
Smallest	142.0	78.3	173.8	121.5	60.0	80.0	57.5	57.5
Average	293.1	238.5	267.6	234.1	331.4	229.6	251.7	271.9
White marlin								
Largest	79.5	94.5	97.0	70.8	102.4	74.5	79.0	102.4
Smallest	31.0	28.5	40.0	39.3	37.5	43.5	43.5	28.5
Average	48.2	52.3	52.7	51.4	55.5	59.6	60.6	52.7
Sailfish								
Largest	59.0	66.3	61.0	67.0	60.1	41.0	84.5	84.5
Smallest	14.3	5.5	10.5	30.0	38.1	9.0	5.5	5.5
Average	40.9	38.9	40.9	45.3	55.1	27.7	44.4	41.4

Table 3.--Sex ratios of examined billfishes caught in the northern Gulf of Mexico, 1977 (M = Males; F = Females)

	Panama City	Destin	Pensacola	Orange Beach	South Pass	Grand Isle	Port Aransas	All Areas Combined
Blue marlin								
No. of M:no. of F	0:6	11:19	1:8	5:8	5:50	3:2	3:25	28:118
No. of M per one F	0	0.6:1	0.1:1	0.6:1	0.1:1	1.5:1	0.1:1	0.2:1
One M per no. F	0	1:1.7	1:8.0	1:1.6	1:10.0	1:0.7	1:8.3	1:4.2
White marlin								
No. of M:no. of F	29:30	51:56	10:42	8:5	15:35	5:4	1:12	119:184
No. of M per one F	1.0:1	0.9:1	0.2:1	1.6:1	0.4:1	1.2:1	0.1:1	0.6:1
One M per no. F	1:1.0	1:1.1	1:4.2	1:0.6	1:2.3	1:0.8	1:12.0	1:1.5
Sailfish								
No. of M:no. of F	23:33	41:85	3:9	3:7	1:4	1:1	28:34	100:173
No. of M per one F	0.7:1	0.5:1	0.3:1	0.4:1	0.2:1	1:1	0.8:1	0.6:1
One M per no. F	1:1.4	1:2.1	1:3.0	1:2.3	1:4.0	1:1	1:1.2	1:1.7

Table 4.--Billfishes hooked-per-hour-of-trolling (relative abundance), and hours trolled to hook a fish in the northern Gulf of Mexico, 1977

Port	Hours trolled	Fish hooked-per-hour-of-trolling and hours trolled to hook one fish ( ) Blue M.	White M.	Sailfish	All Billfish
		Number			
Northeastern Gulf	11,278.8	0.022 (45.3)	0.058 (17.3)	0.037 (27.2)	0.117 (8.5)
Panama City	1,579.9	0.026 (38.5)	0.092 (10.9)	0.063 (16.0)	0.183 (5.5)
Destin	5,477.8	0.022 (44.5)	0.055 (18.0)	0.044 (22.5)	0.122 (8.2)
Pensacola	2,192.7	0.016 (62.6)	0.055 (18.1)	0.015 (68.5)	0.088 (11.3)
Orange Beach	2,028.4	0.025 (40.6)	0.040 (25.0)	0.020 (49.5)	0.085 (11.8)
Northcentral Gulf	8,170.6	0.024 (42.3)	0.015 (65.4)	0.002 (583.6)	0.041 (24.6)
South Pass	5,500.3	0.030 (33.7)	0.017 (57.3)	0.002 (550.0)	0.049 (20.4)
Grand Isle	2,670.3	0.011 (89.0)	0.011 (92.1)	0.001 (667.6)	0.024 (42.4)
Northwestern Gulf					
Port Aransas	5,037.6	0.021 (47.1)	0.010 (102.8)	0.027 (37.0)	0.058 (17.2)
All three areas	24,487.0	0.022 (44.6)	0.034 (29.7)	0.023 (43.3)	0.080 (12.6)

Table 5.--Hours trolled and billfishes raised, hooked, and boated in the northern Gulf of Mexico, 1977

	Hours trolled	Blue marlin			White marlin			Sailfish			Unidentified billfish	
		R	H	B	R	H	B	R	H	B	R	H
						Number						
Northeastern Gulf	11,278.8	379	249	92	1,064	651	387	605	415	311	83	10
Panama City	1,579.9	44	41	10	165	145	71	111	99	69	21	3
Destin	5,477.8	207	123	51	543	304	208	382	243	193	35	1
Pensacola	2,192.8	54	35	11	188	121	66	55	32	18	15	6
Orange Beach	2,028.4	74	50	20	168	81	42	57	41	31	12	---
Northcentral Gulf	8,170.6	357	193	77	243	125	75	21	14	11	6	---
South Pass	5,500.3	315	163	68	188	96	60	12	10	8	5	---
Grand Isle	2,670.3	42	30	9	55	29	15	9	4	3	1	---
Northwestern Gulf												
Port Aransas	55,037.6	187	107	48	76	49	20	327	136	100	20	1
All three areas	24,487.0	923	549	217	1,383	825	482	953	565	422	109	11
% of raised			59.5	23.5		59.7	34.9		59.3	44.3		10.1
% of hooked				39.5			58.4			74.7		---

R = Raised.
H = Hooked.
B = Boated.

Table 6.--Hours fished, billfishes hooked, and billfishes hooked-per-hour-of-trolling by wind direction in the northern Gulf of Mexico, 1977

Area	Wind direction				
	Northerly (320-40°)	Easterly (50-130°)	Southerly (140-220°)	Westerly (230-310°)	Variable (Calm incl.)
	Number				
Northeastern Gulf					
Hours fished	358.3	978.4	6,282.8	1,637.8	2,364.2
Fish hooked	33	121	801	155	207
Fish hooked-per-hour	0.092	0.124	0.128	0.095	0.088
Northcentral Gulf					
Hours fished	145.3	1,409.5	4,201.6	2,430.1	152.0
Fish hooked	2	59	123	125	18
Fish hooked-per-hour	0.014	0.042	0.029	0.051	0.118
Northwestern Gulf					
Hours fished	40.5	4,145.8	459.6	81.9	414.4
Fish hooked	1	196	46	6	43
Fish hooked-per-hour	0.025	0.047	0.100	0.073	0.104
All areas combined					
Hours fished	544.1	6,533.7	10,994.0	4,149.8	2,930.6
Fish hooked	36	376	970	286	268
Fish hooked-per-hour	0.066	0.058	0.088	0.069	0.091

Table 7.--Hours fished, billfishes hooked, and billfishes hook-per-hour-of-trolling by cloud cover in the northern Gulf of Mexico, 1977

Area	Percent cloud cover			
	0	10-30	40-60	70-90
	Number			
Northeastern Gulf				
Hours fished	2,879	4,250	2,485	1,804
Fish hooked	217	484	342	238
Fish hooked-per-hour	0.075	0.114	0.138	0.132
Northcentral Gulf				
Hours fished	1,266	3,691	2,594	747
Fish hooked	46	121	112	44
Fish hooked-per-hour	0.036	0.033	0.043	0.059
Northwestern Gulf				
Hours fished	2,704	1,311	1,099	6
Fish hooked	154	69	68	0
Fish hooked-per-hour	0.057	0.053	0.062	0
All areas combined				
Hours fished	6,849	9,252	6,178	2,557
Fish hooked	417	674	522	282
Fish hooked-per-hour	0.061	0.073	0.084	0.110

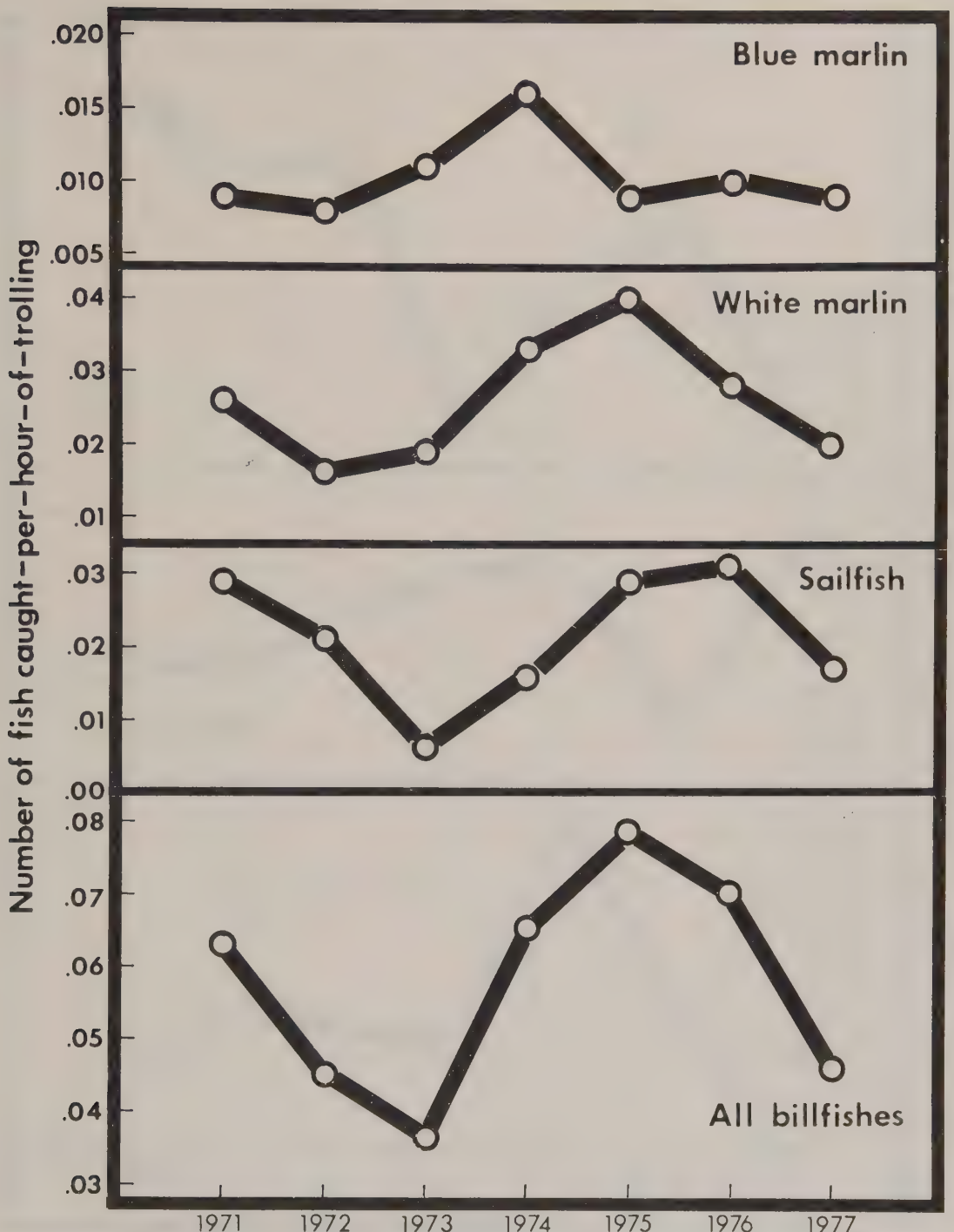


Figure 1.--Number of billfishes caught-per-hour-of-trolling in the northern Gulf of Mexico, 1971-77.

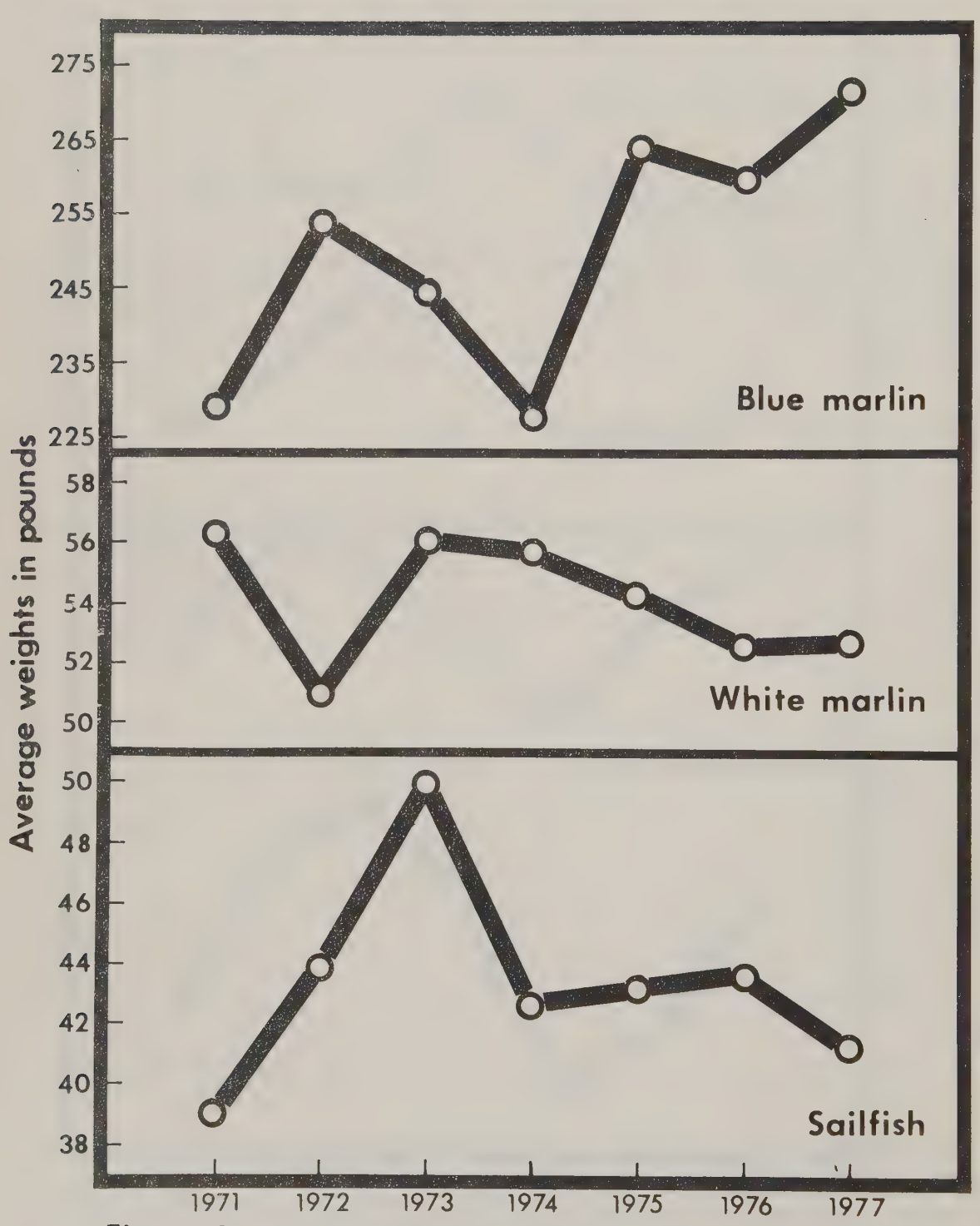


Figure 2.-- Average weights (pounds) of billfishes in the northern Gulf of Mexico, 1971-77.

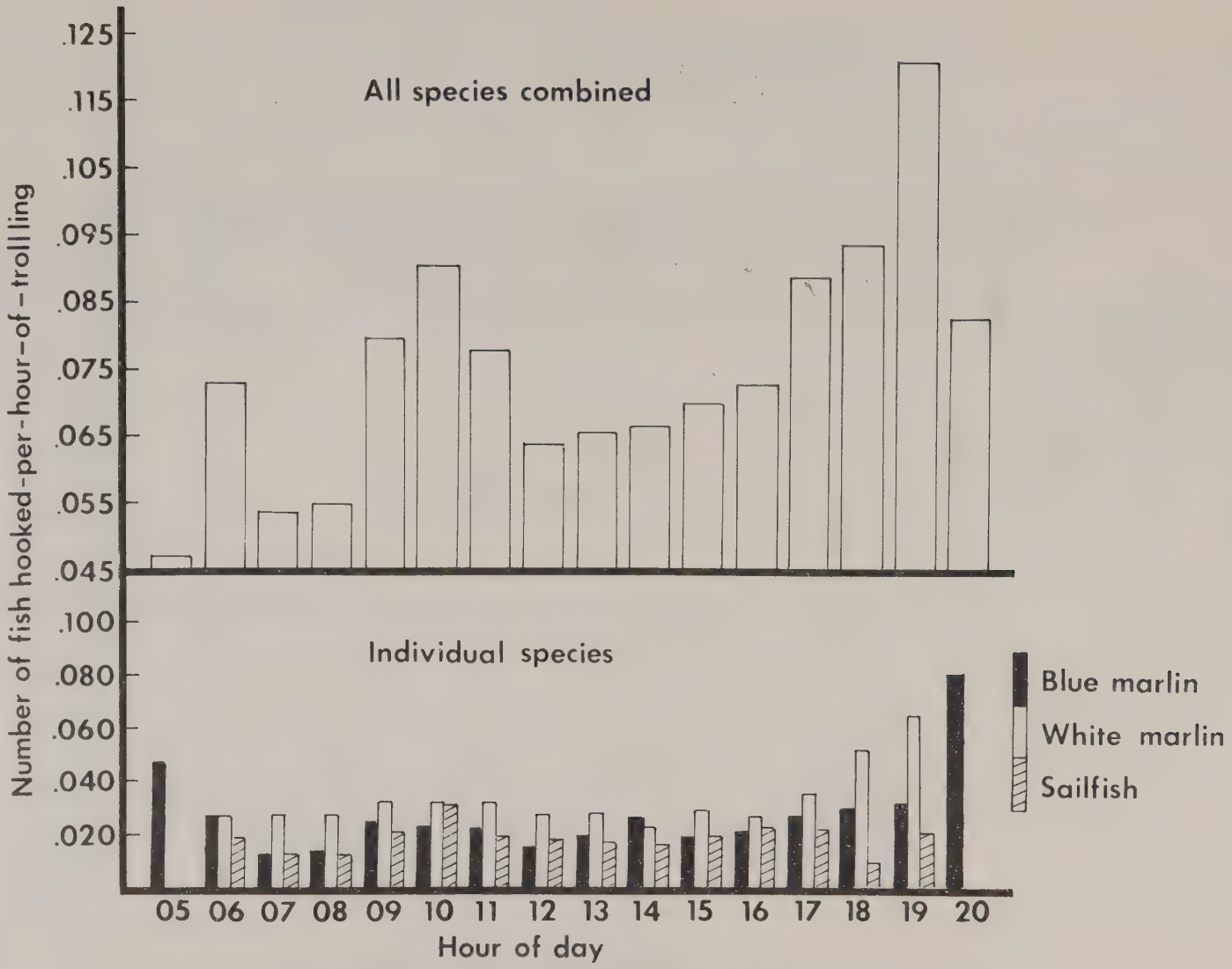


Figure 3.-- Number of billfishes hooked-per-hour-of-trolling by time of day in the northern Gulf of Mexico, 1977.

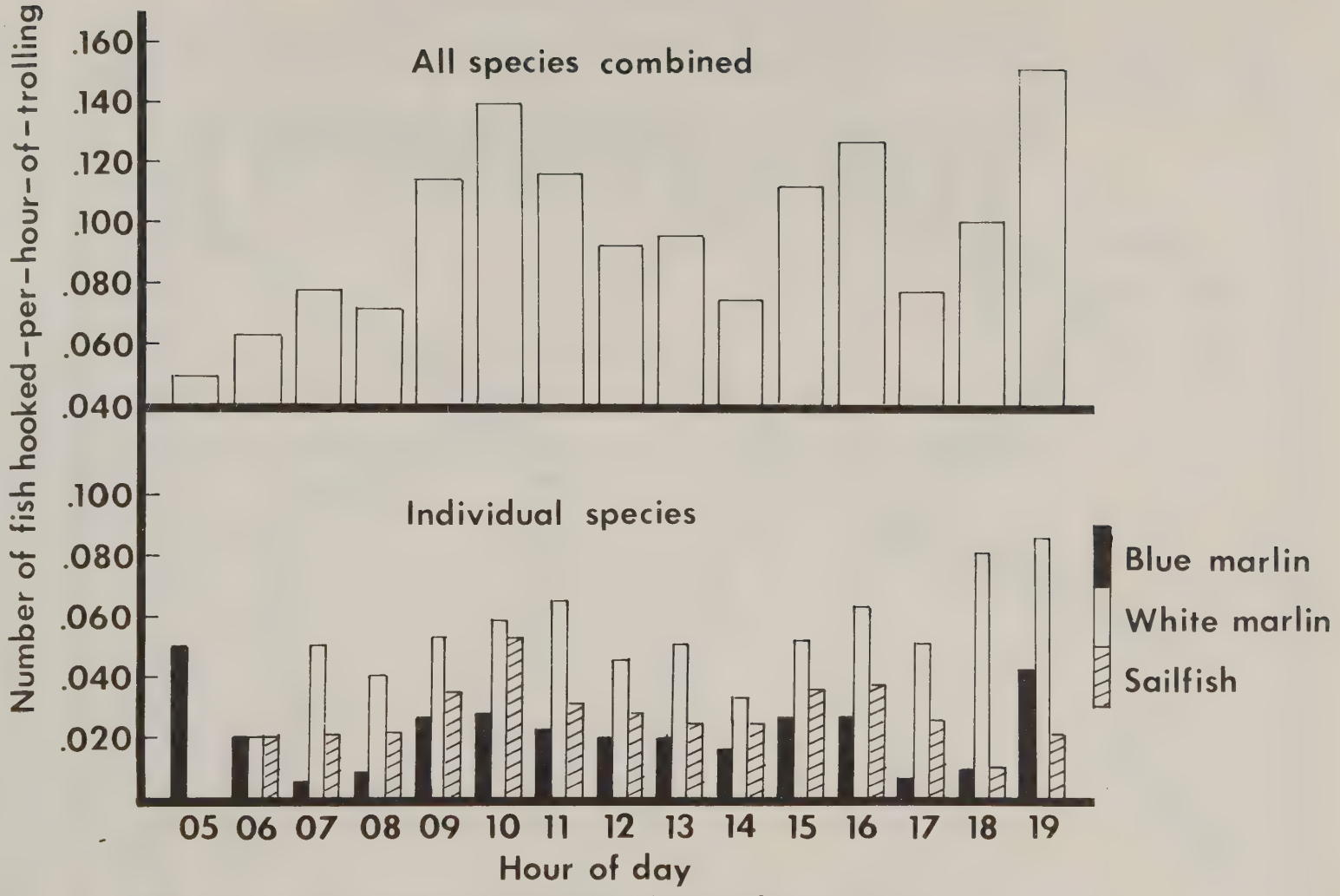


Figure 4.-- Number of billfishes hooked-per-hour-of-trolling by time of day in the northeastern Gulf of Mexico, 1977.

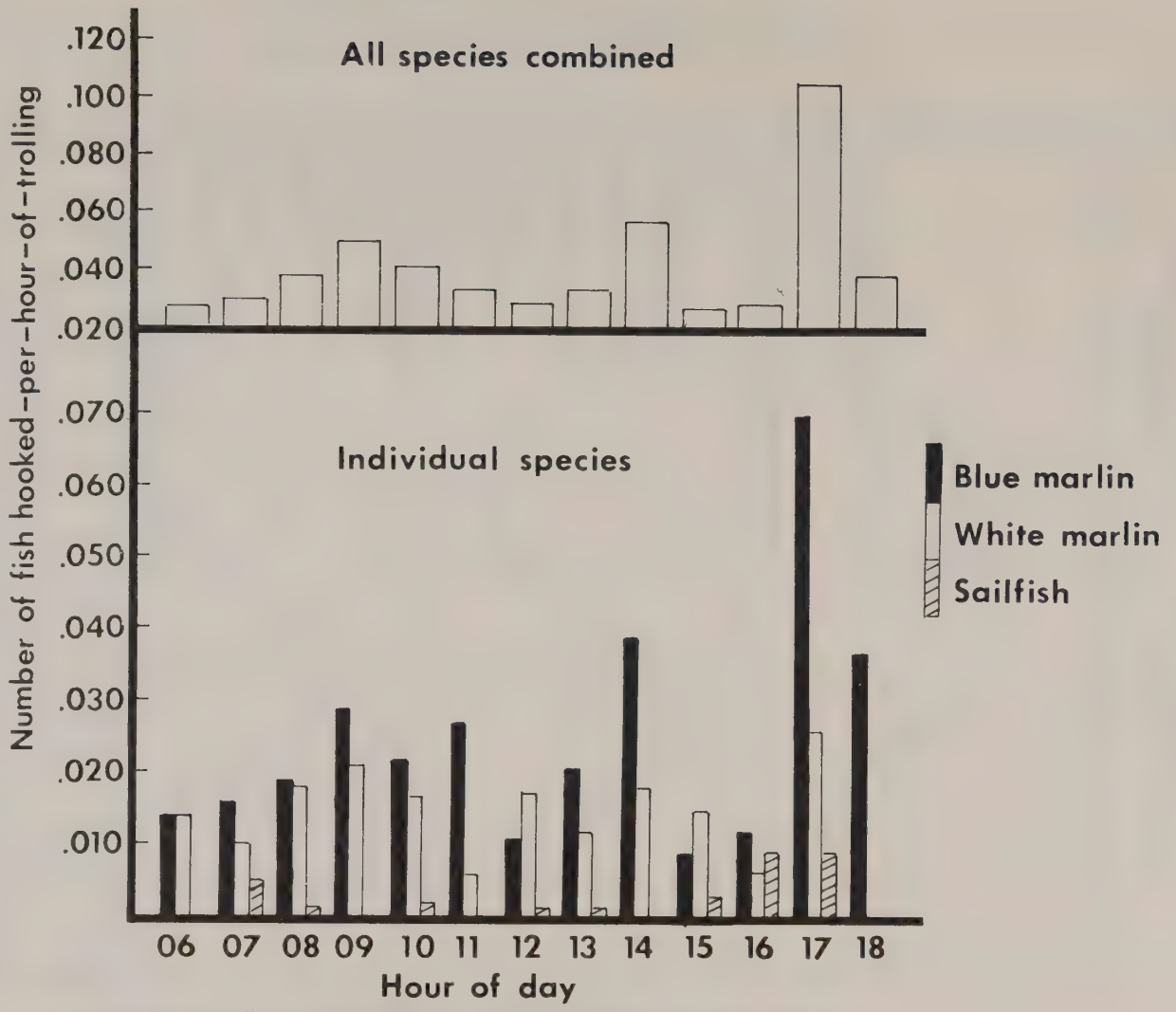


Figure 5.-- Number of billfishes hooked-per-hour-of-trolling by time of day in the northcentral Gulf of Mexico, 1977.

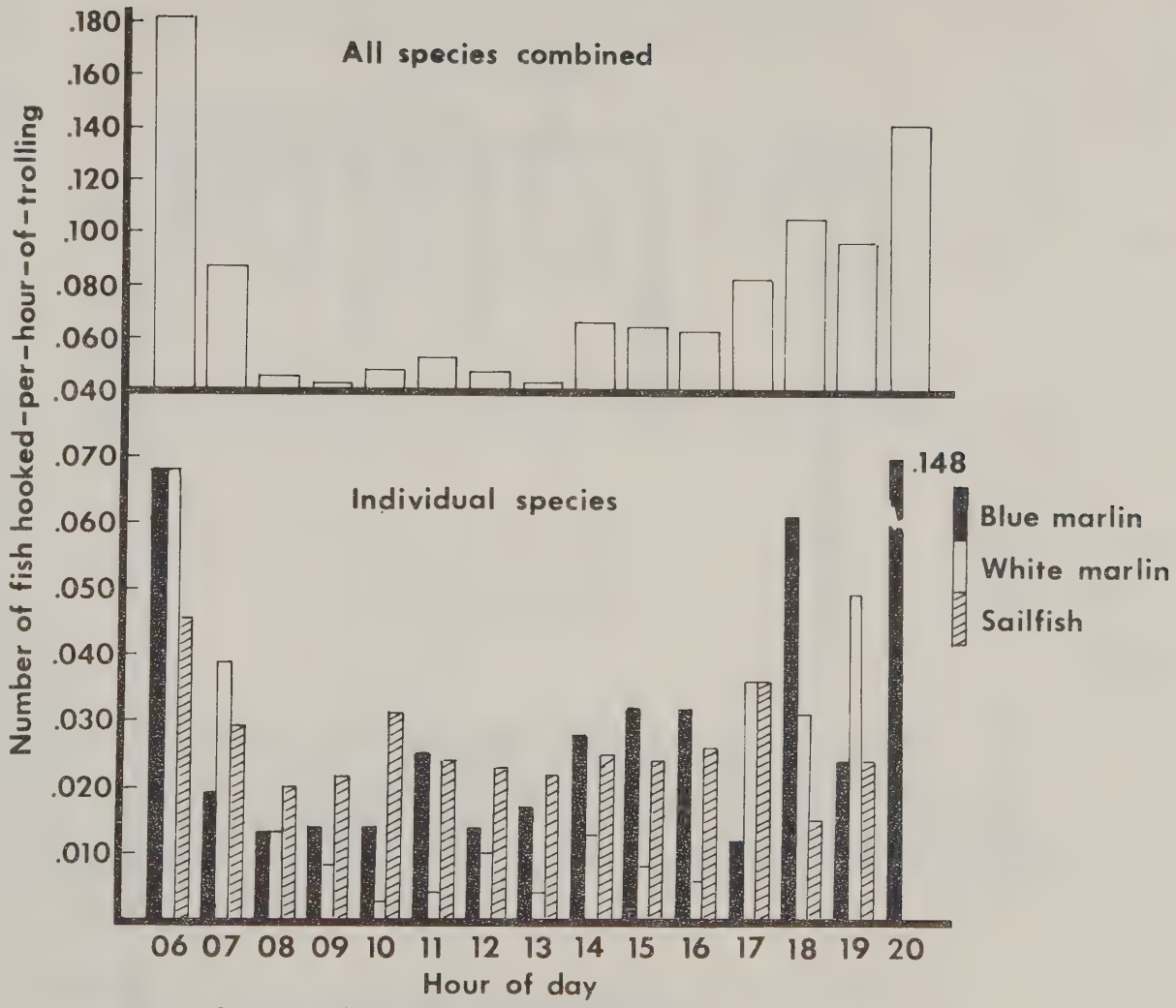


Figure 6.--Number of billfishes hooked-per-hour-of-trolling by time of day in the northwestern Gulf of Mexico, 1977.

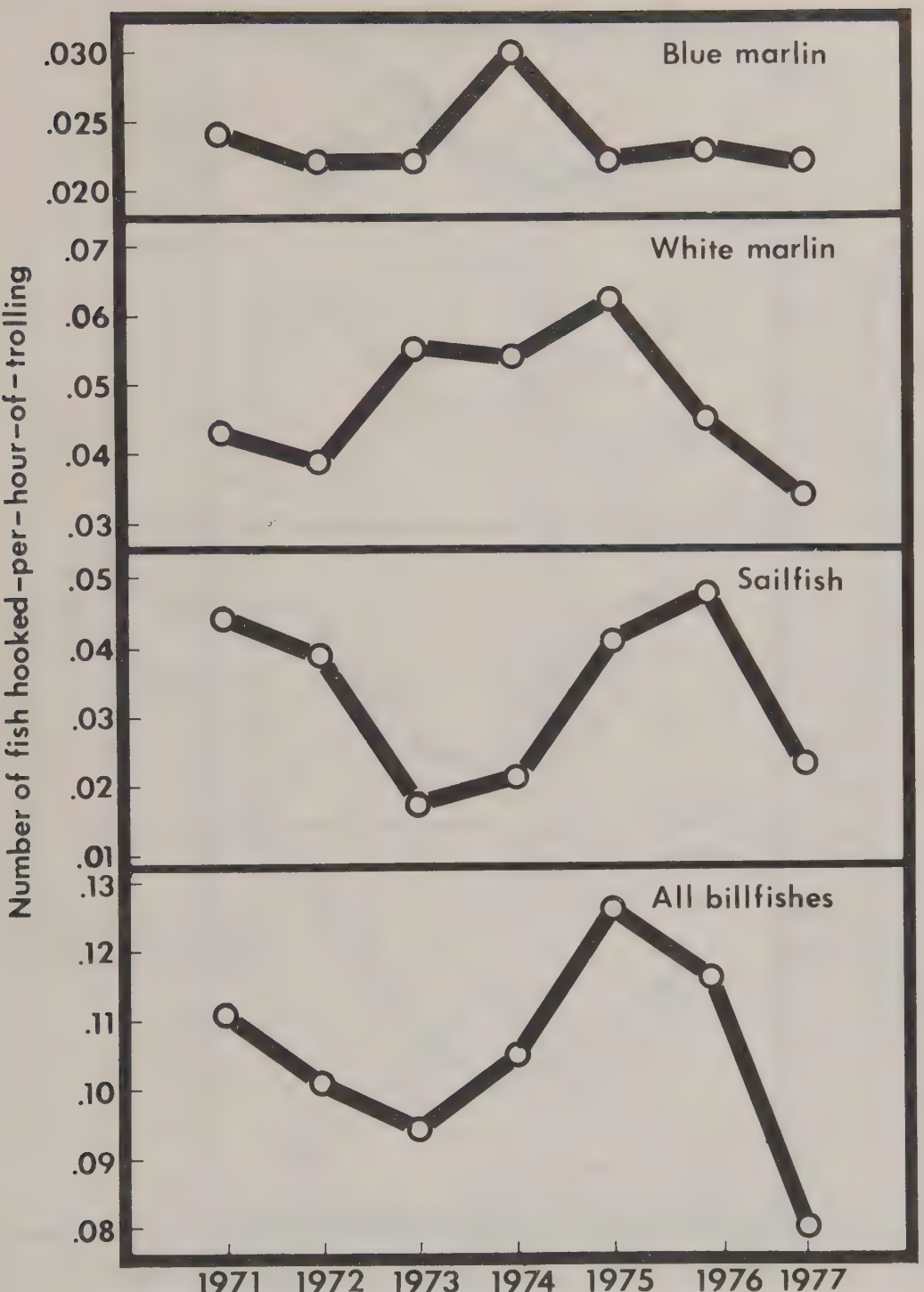


Figure 7.--Number of billfishes hooked-per-hour-of-trolling in the northern Gulf of Mexico, 1971-77.

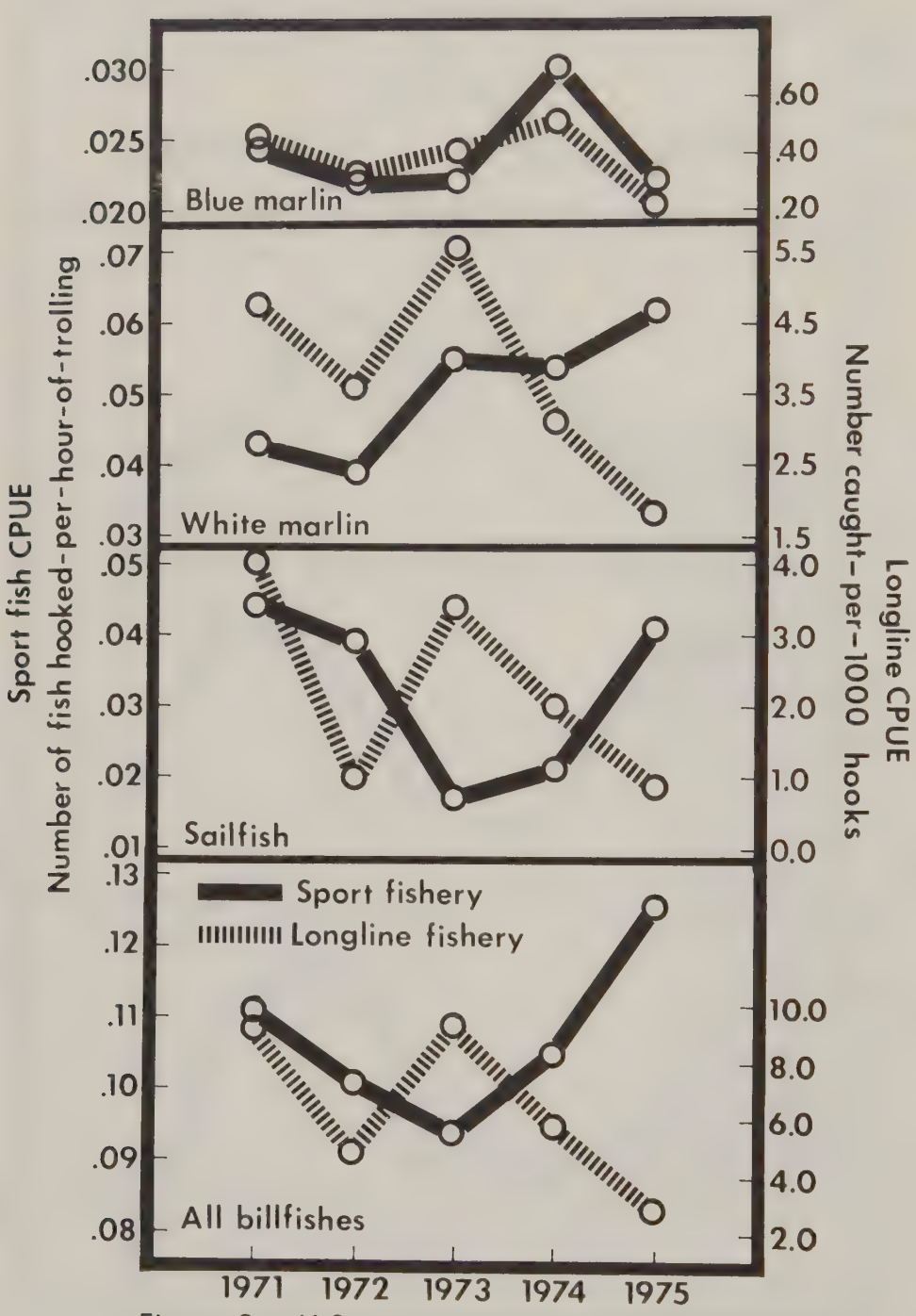


Figure 8.--U.S. sport fishery and Japanese longline fishery catch-per-unit-of-effort between 25-30° N. latitude and 85-100°W. longitude, 1971-75.

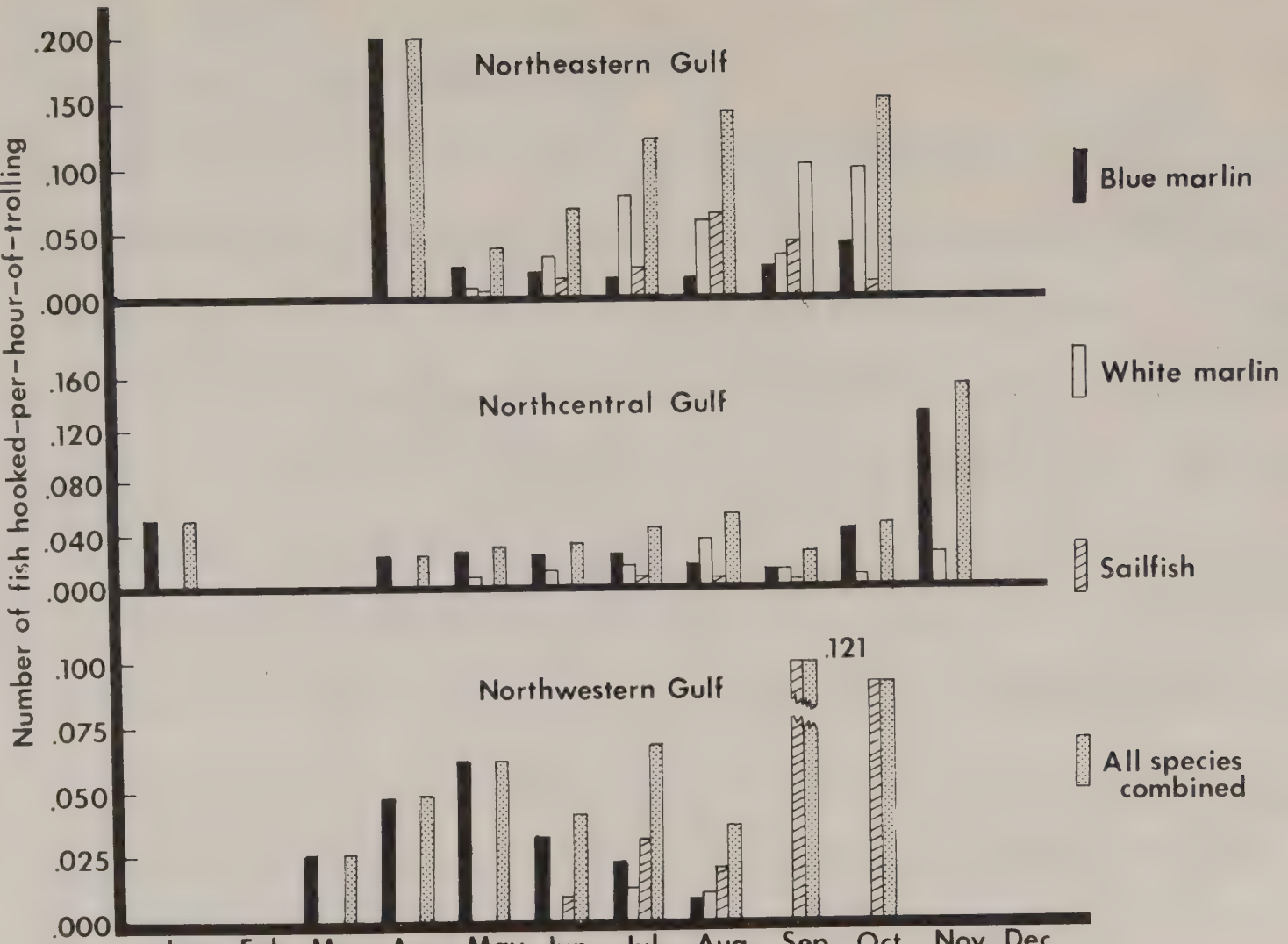


Figure 9.-- Number of billfishes hooked-per-hour-of-trolling by monthly periods in the northern Gulf of Mexico, 1977.

LEGEND

Fishing area bound by heavy black lines. Number of fish raised-per-hour-of-trolling:

.001-.049

.050-.099

≥.100

No fish raised in squares without symbols.

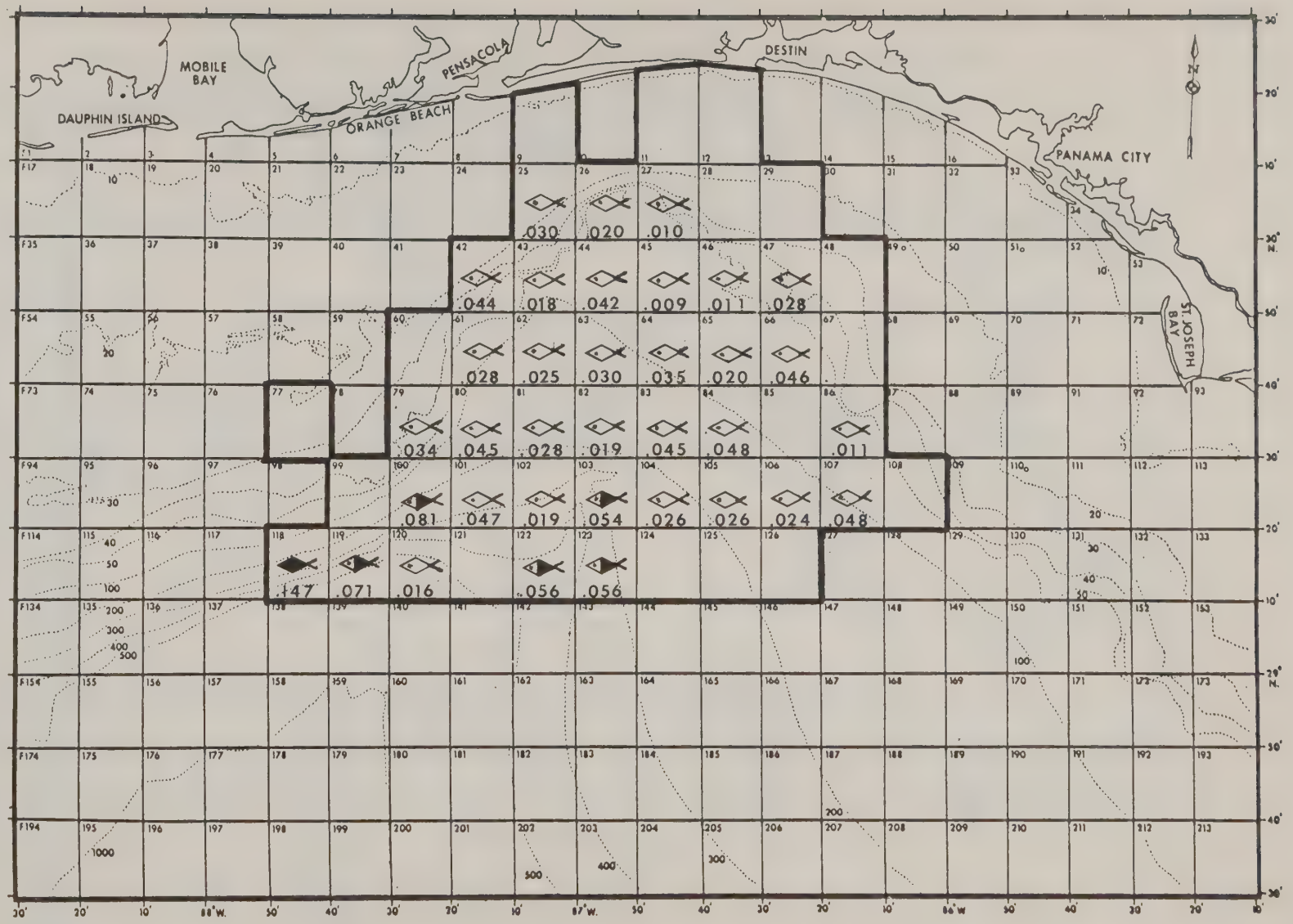


CHART 1.--Number of blue marlin raised-per-hour-of-trolling in the northeastern Gulf of Mexico by 10-min squares, 1977.

LEGEND

Fishing area bound by heavy black lines. Number of fish raised-per-hour-of-trolling:

.001–.104

.105–.209

≥.210

No fish raised in squares without symbols.

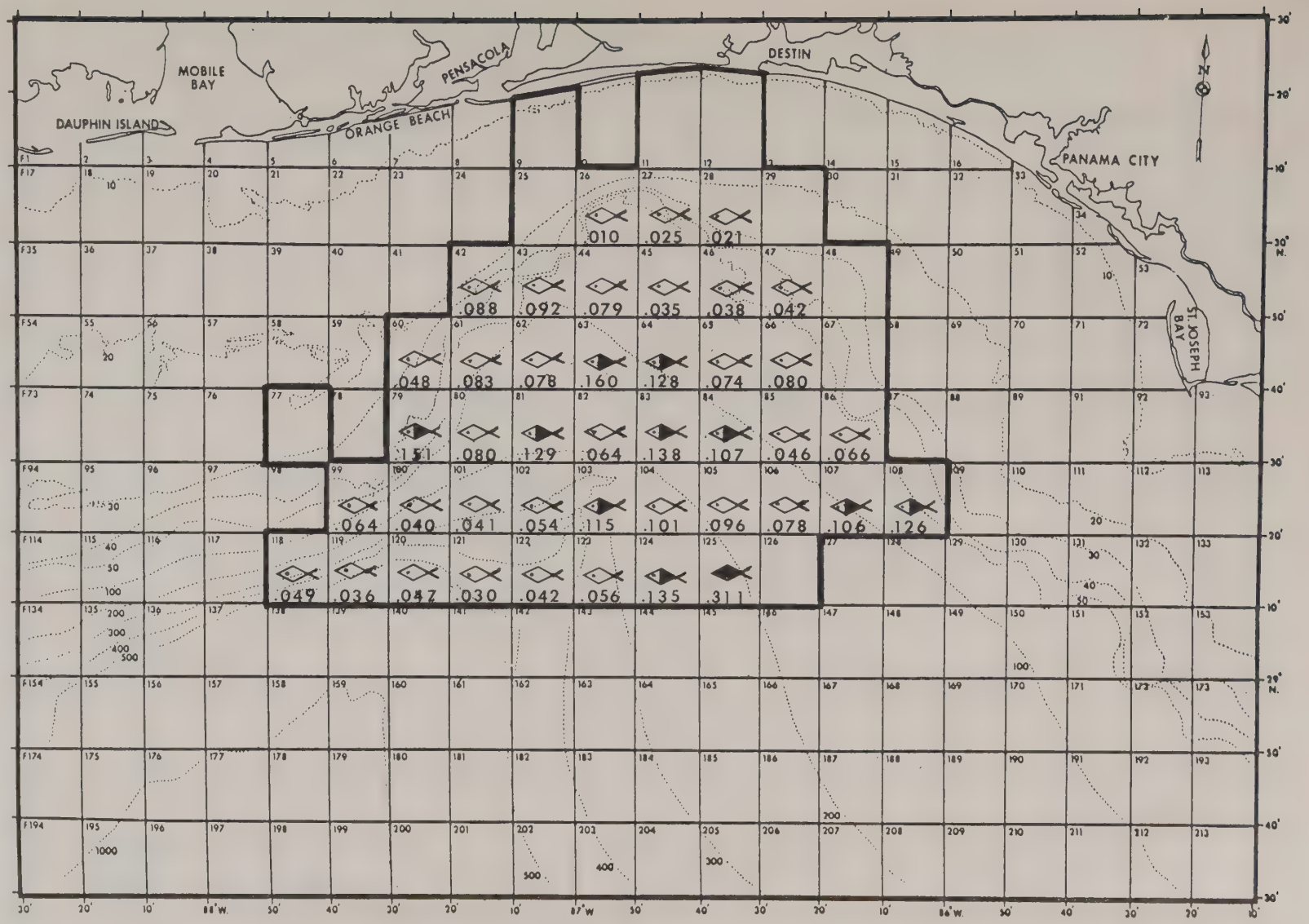


CHART 2.-- Number of white marlin raised-per-hour-of-trolling in the northeastern Gulf of Mexico by 10-min squares, 1977.

LEGEND

Fishing area bound by heavy black lines. Number of fish raised-per-hour-of-trolling:

.001–.084

.085–.169

≥.170

No fish raised in squares without symbols.

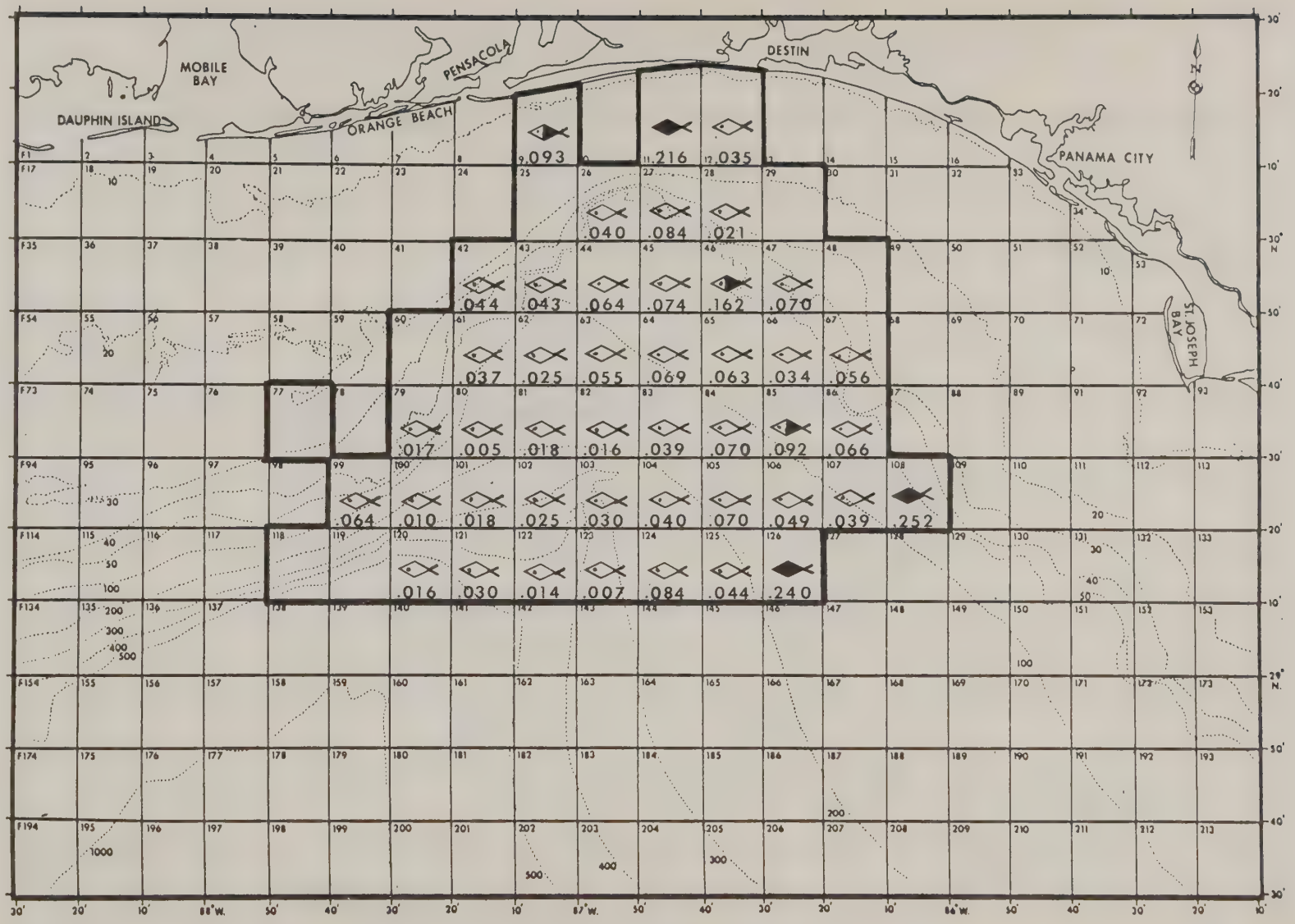


CHART 3.--Number of sailfish raised-per-hour-of-trolling in the northeastern Gulf of Mexico by 10-min squares, 1977.

LEGEND

Fishing area bound by heavy black lines. Number of fishes raised-per-hour-of-trolling:

.001–.124

.125–.249

≥.250

No fishes raised in squares without symbols.

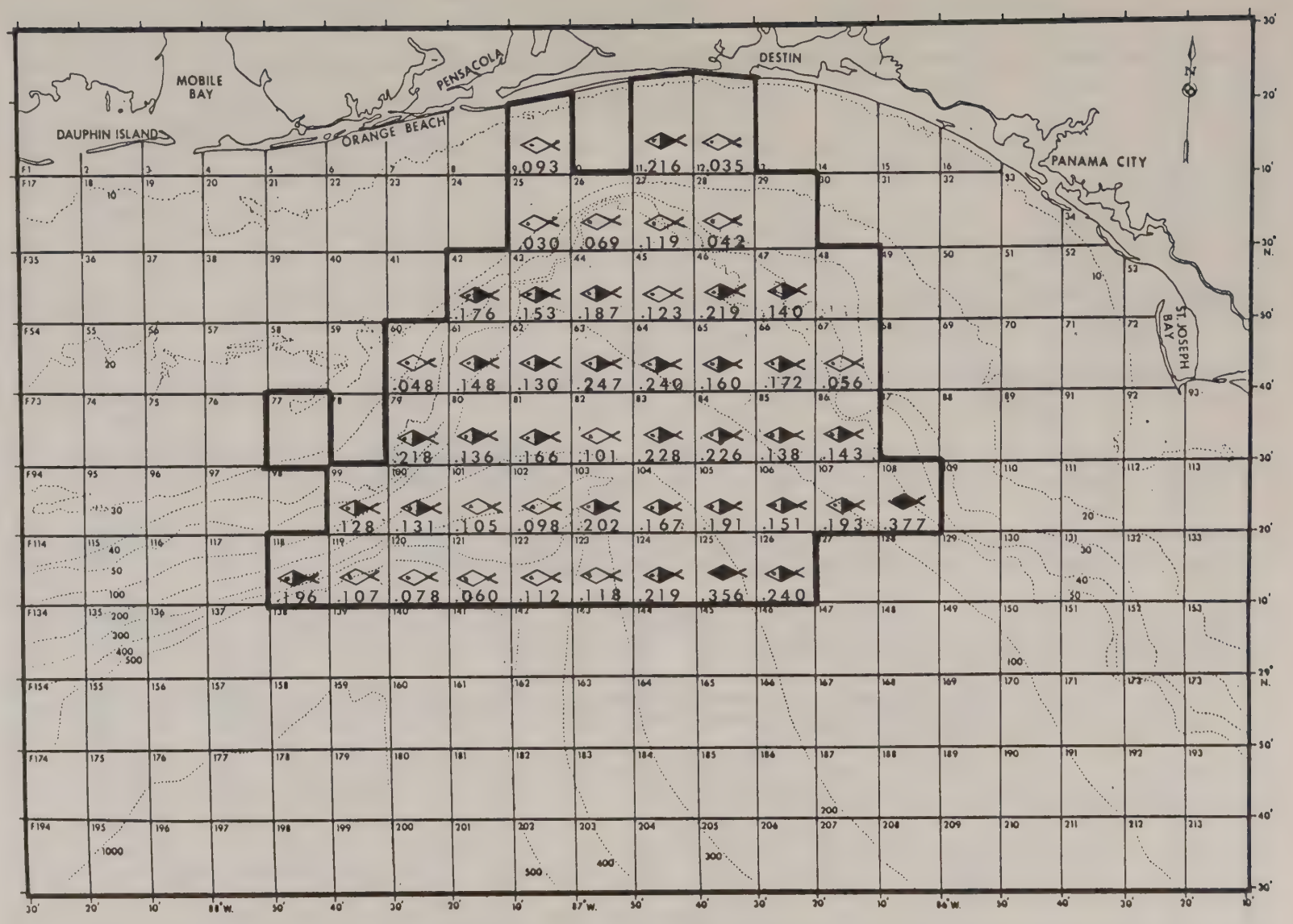


CHART 4.-- Number of billfishes raised-per-hour-of-trolling in the northeastern Gulf of Mexico by 10-min squares, 1977.

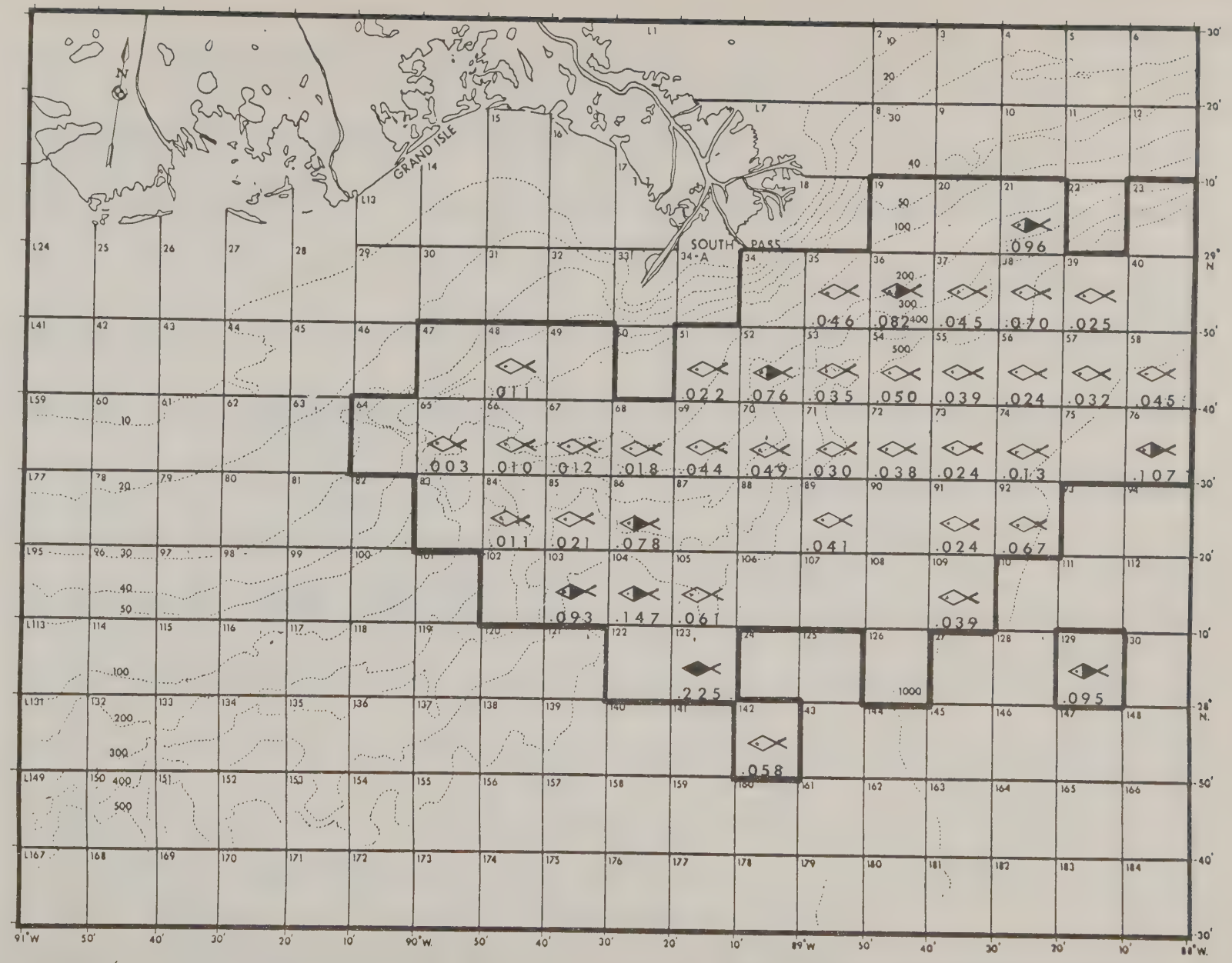
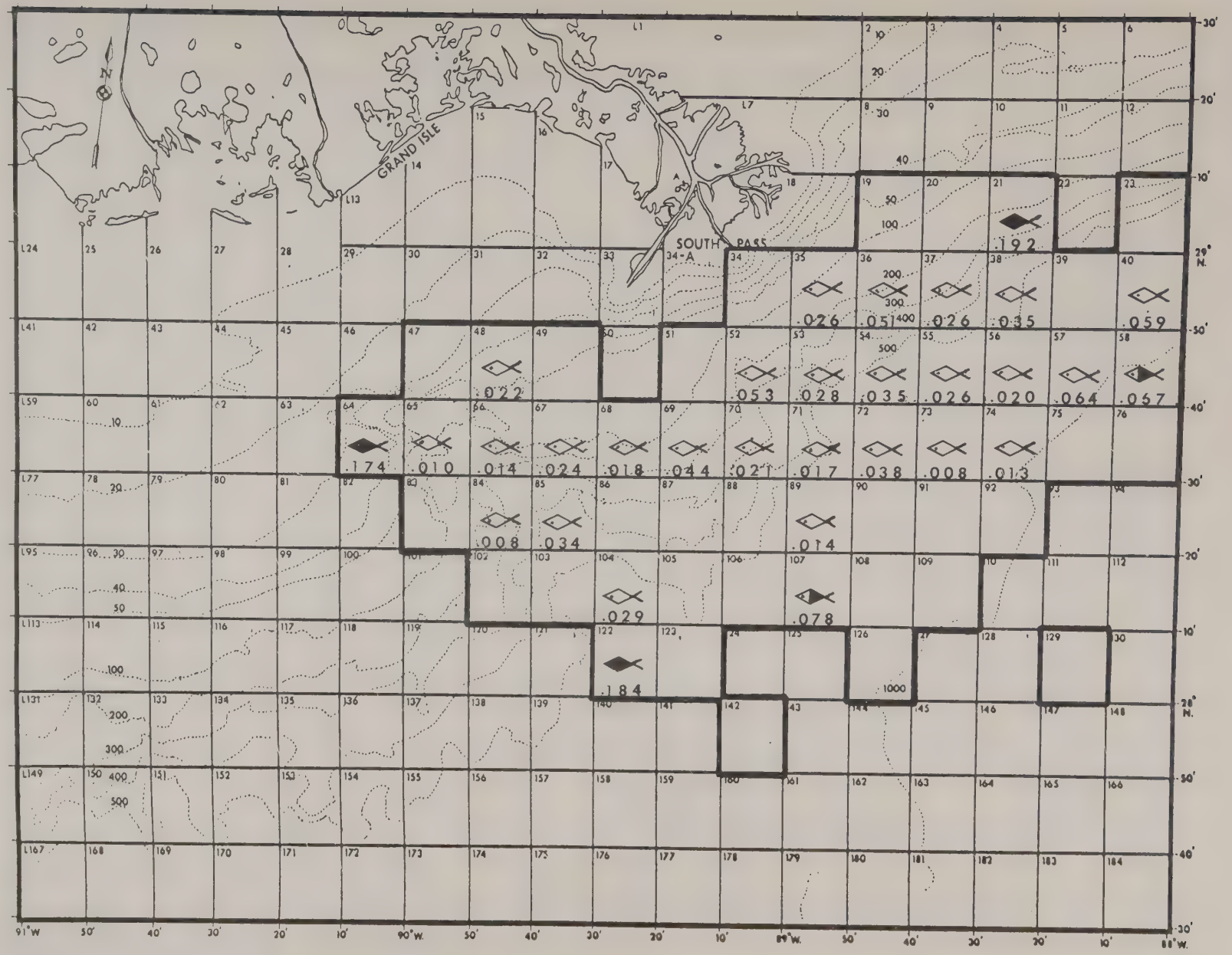


CHART 5.-- Number of blue marlin raised-per-hour-of-trolling in the northcentral Gulf of Mexico by 10-min squares, 1977.



LEGEND

Fishing area bound by heavy black lines. Number of fish raised-per-hour-of-trolling:

.001–.064

.065–.129

≥.130

No fish raised in squares without symbols.

CHART 6.-- Number of white marlin raised-per-hour-of-trolling in the northcentral Gulf of Mexico by 10-min squares, 1977.

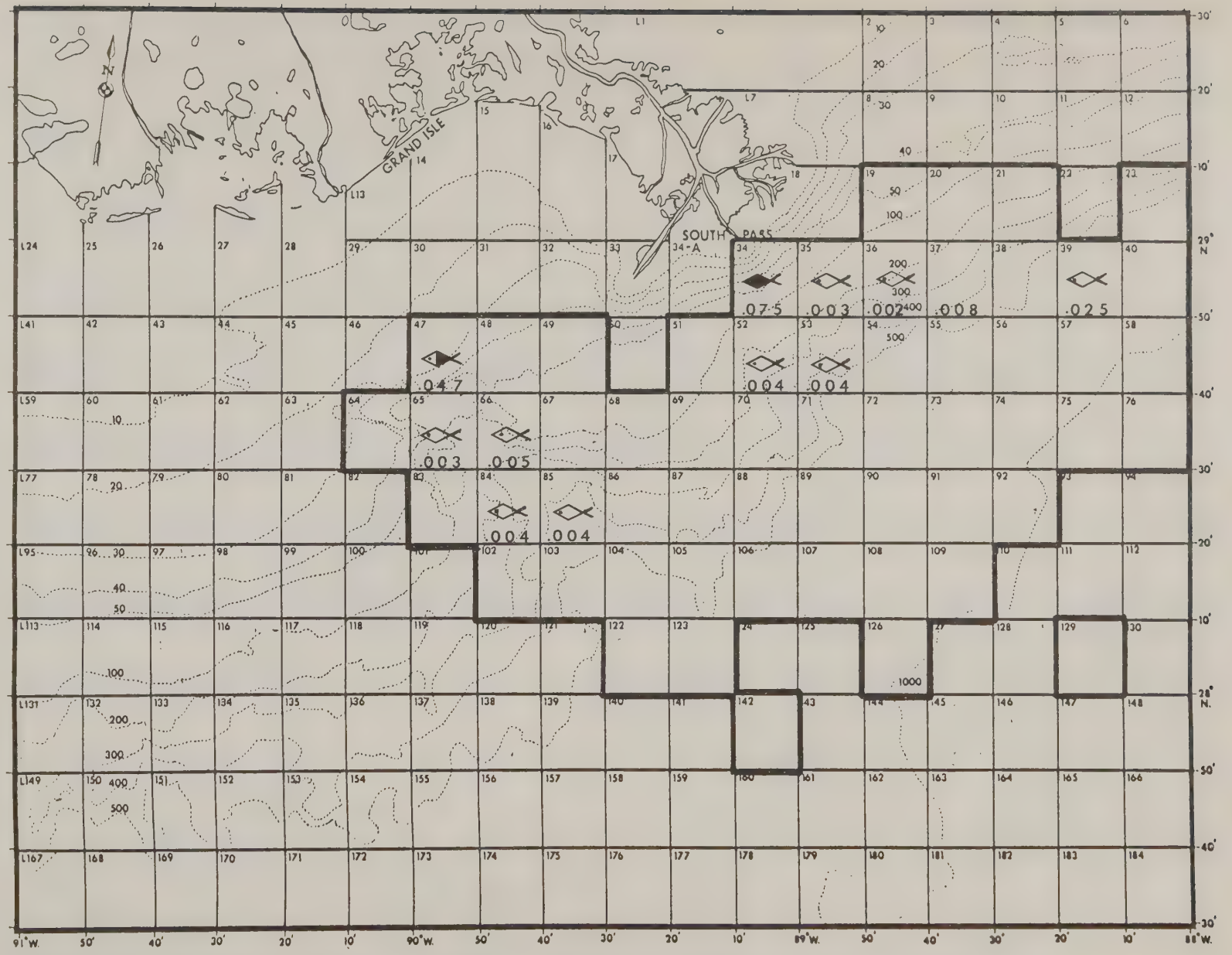
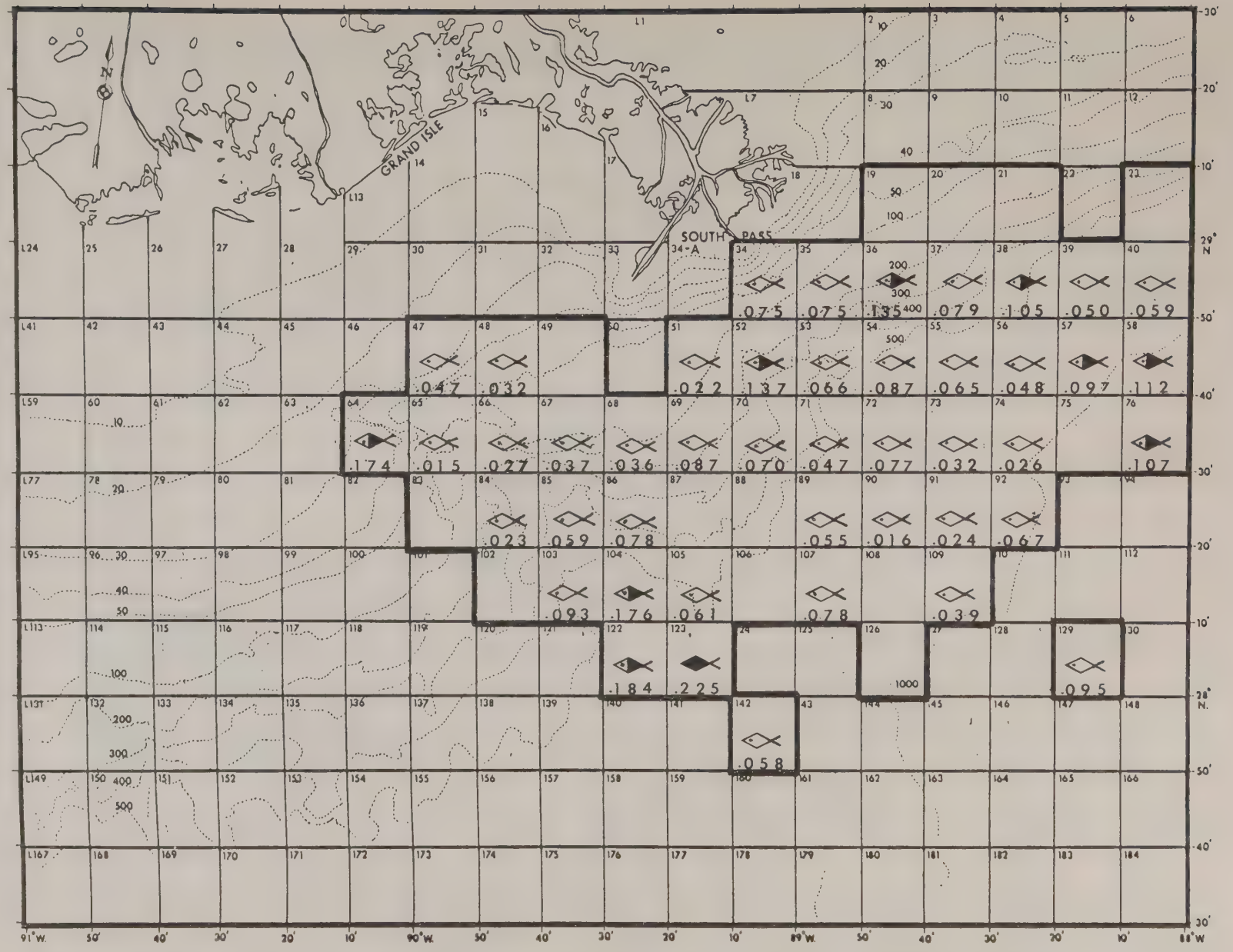


CHART 7.--Number of sailfish raised-per-hour-of-trolling in the northcentral Gulf of Mexico by 10-min squares, 1977.



LEGEND

Fishing area bound by heavy black lines. Number of fishes raised-per-hour-of-trolling:

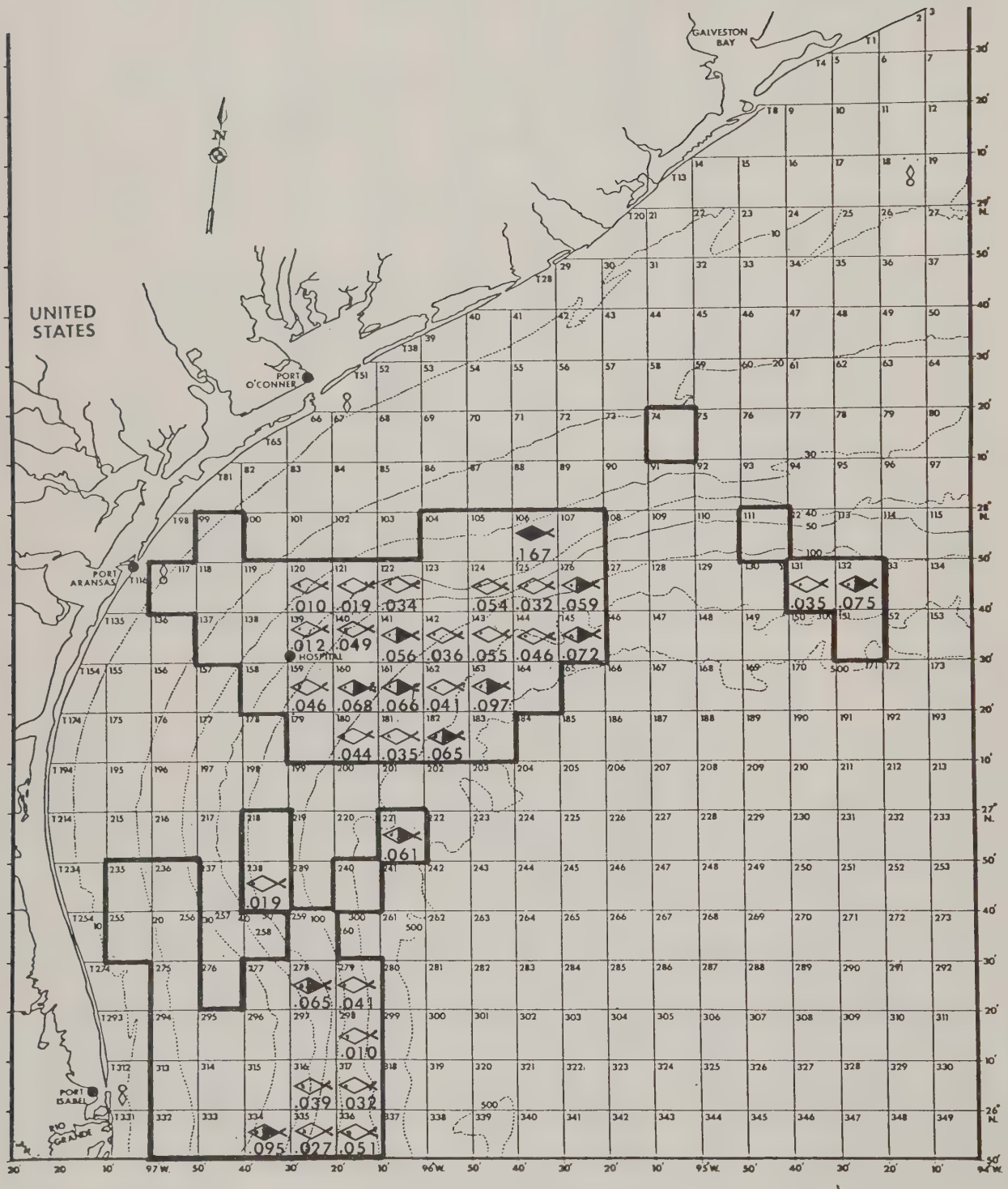
.001–.095

.096–.190

≥.191

No fishes raised in squares without symbols.

CHART 8.--Number of billfishes raised-per-hour-of-trolling in the northcentral Gulf of Mexico by 10-min squares, 1977.



LEGEND

Fishing areas bound by heavy black lines.

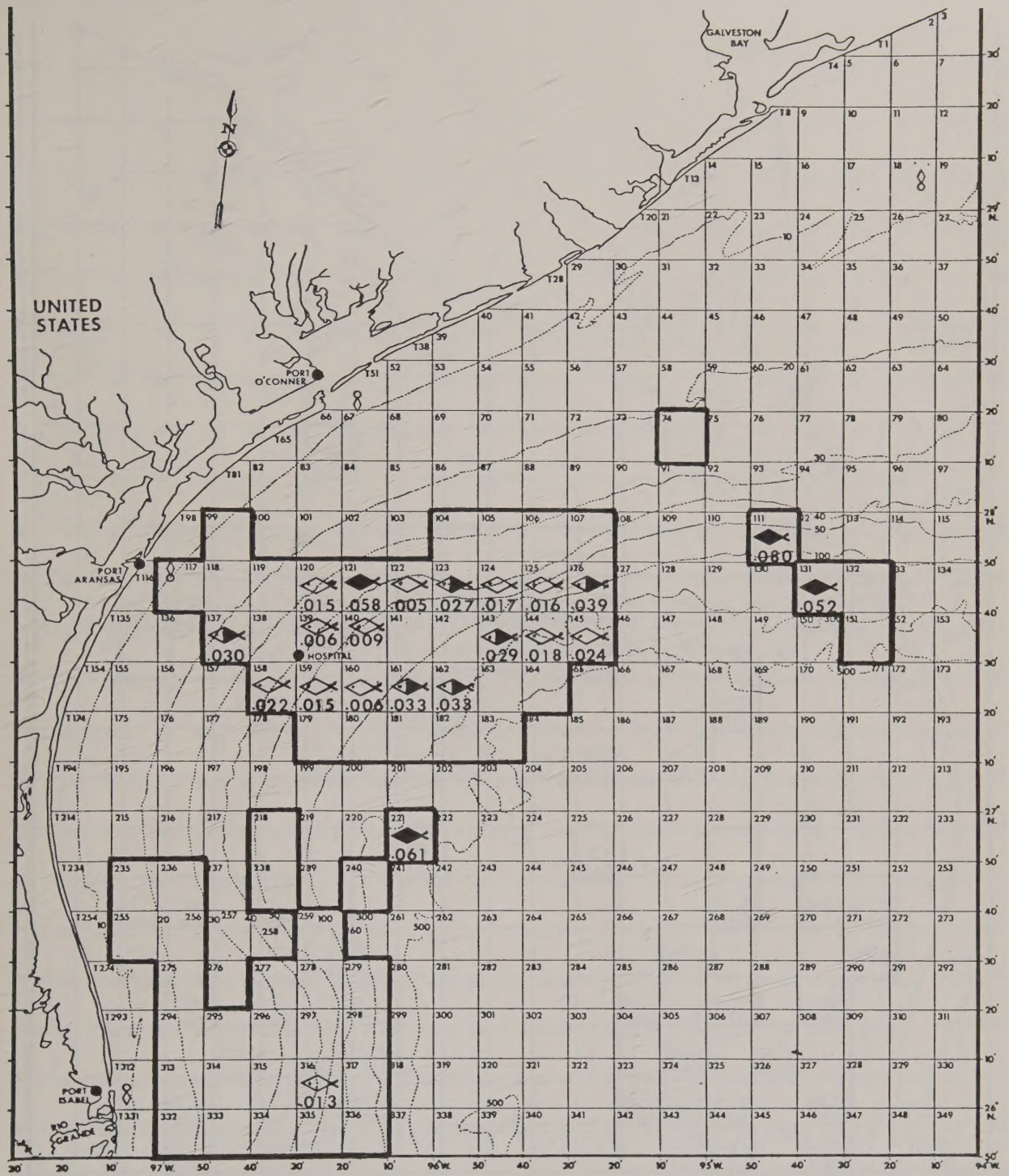
No fish raised in squares without symbols.

.001—.055 fish raised-per-hour-of-trolling.

.056—.110 fish raised-per-hour-of-trolling.

≥.111 fish raised-per-hour-of-trolling.

CHART 9.--Number of blue marlin raised-per-hour-of-trolling in the northwestern Gulf of Mexico by 10-min squares, 1977.



LEGEND

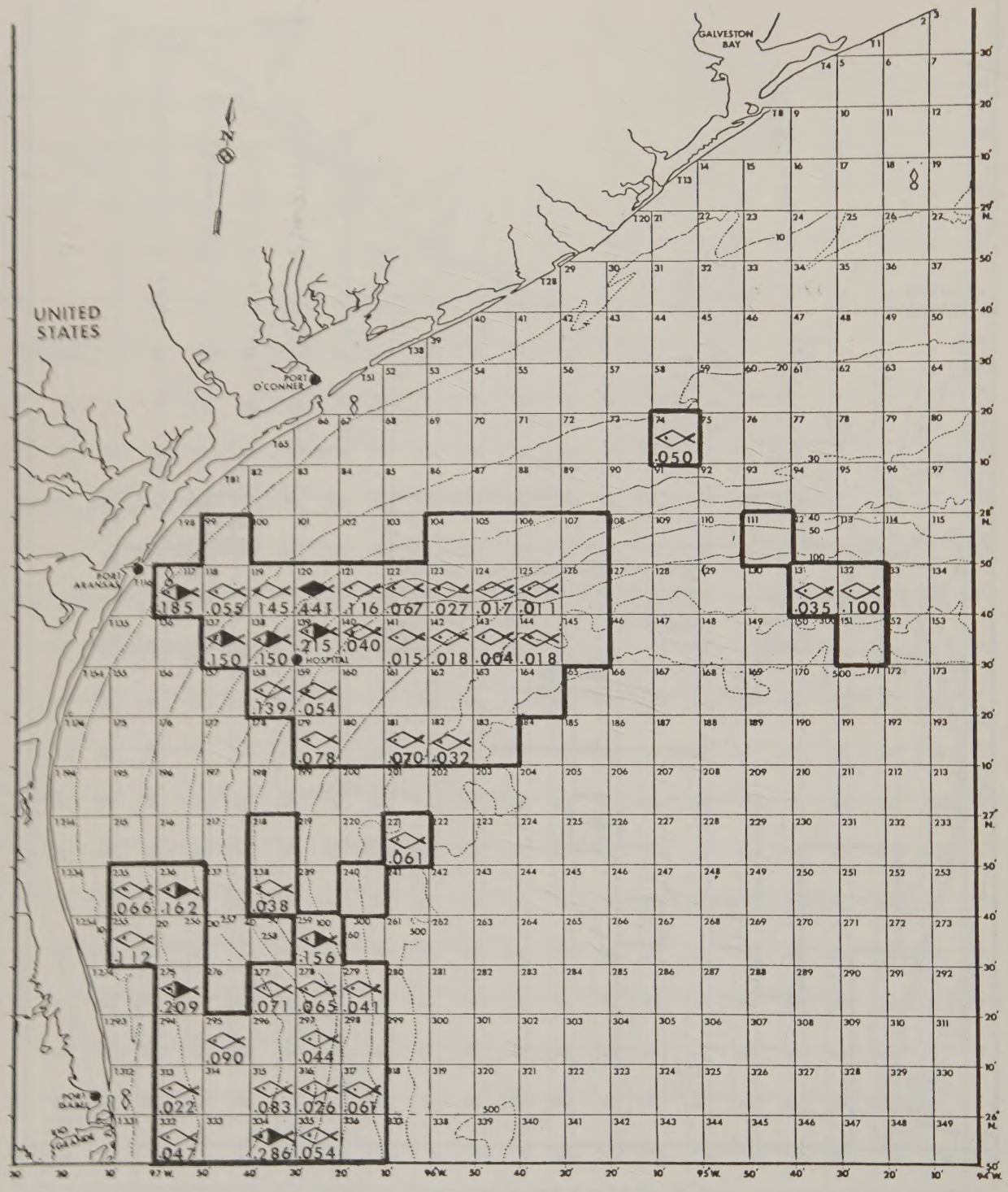
Fishing areas bound by heavy black lines. No fish raised in squares without symbols.

.001–.025 fish raised-per-hour-of-trolling.

.026–.050 fish raised-per-hour-of-trolling.

≥.051 fish raised-per-hour-of-trolling.

CHART 10.--Number of white marlin raised-per-hour-of-trolling in the northwestern Gulf of Mexico by 10-min squares, 1977.



LEGEND

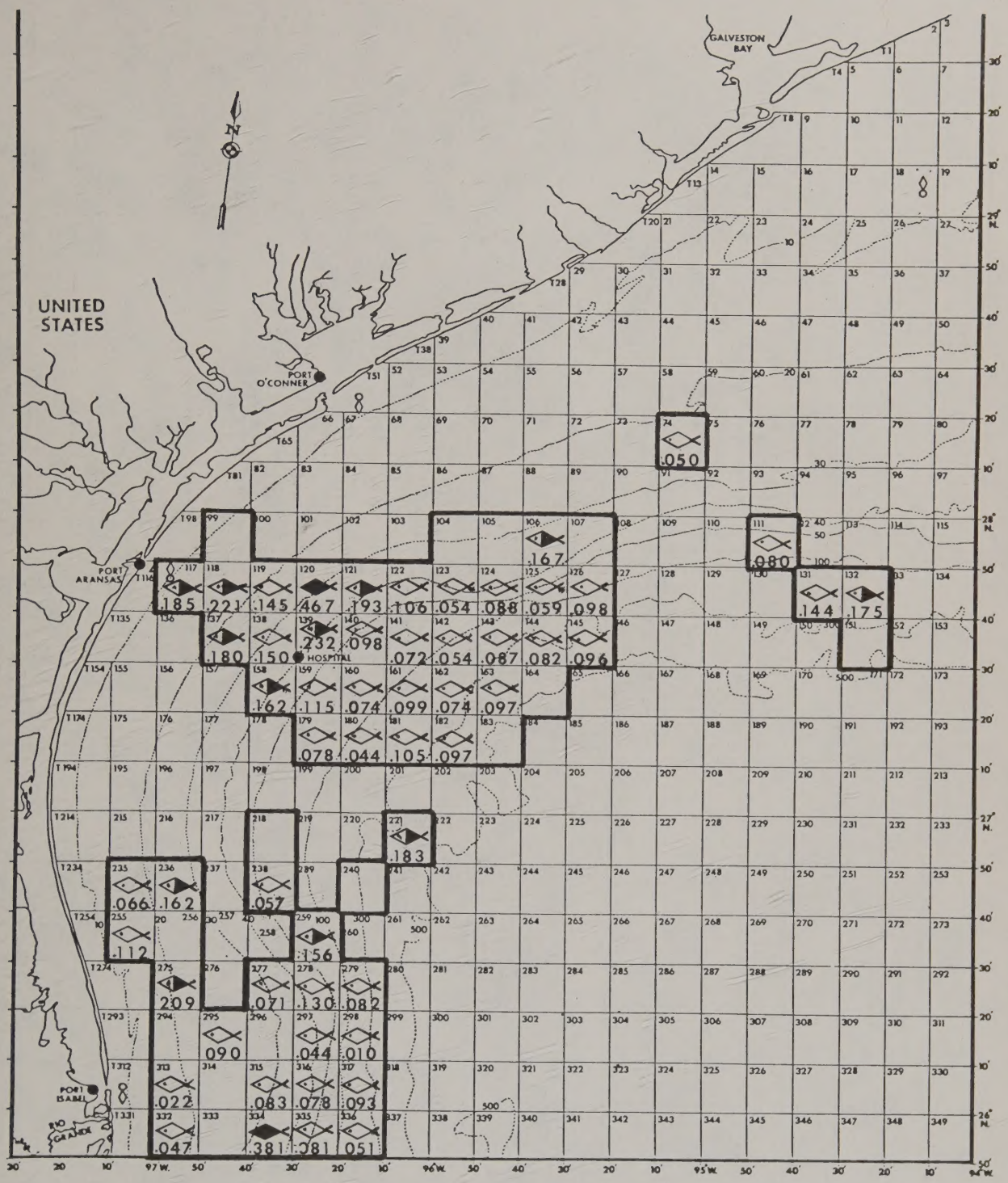
Fishing areas bound by heavy black lines. No fish raised in squares without symbols.

.001–.145 fish raised-per-hour-of-trolling.

.146–.290 fish raised-per-hour-of-trolling.

≥.291 fish raised-per-hour-of-trolling.

CHART 11.--Number of sailfish raised-per-hour-of-trolling in the northwestern Gulf of Mexico by 10-min squares, 1977.



LEGEND

Fishing areas bound by heavy black lines. No fishes raised in squares without symbols.

.001–.155 fishes raised-per-hour-of-trolling.

.156–.310 fishes raised-per-hour-of-trolling.

≥.311 fishes raised-per-hour-of-trolling.

CHART 12.--Number of billfishes raised-per-hour-of-trolling in the northwestern Gulf of Mexico by 10-min squares, 1977.